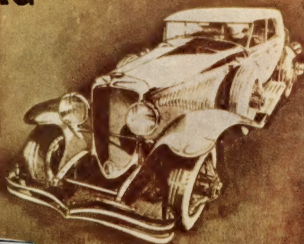


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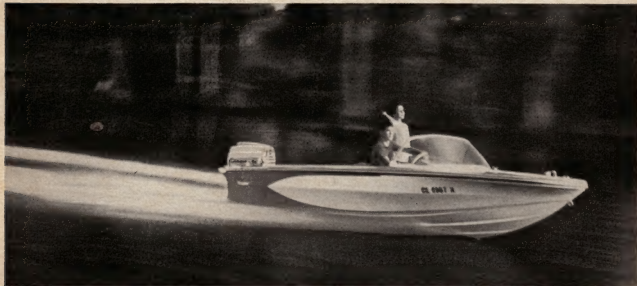
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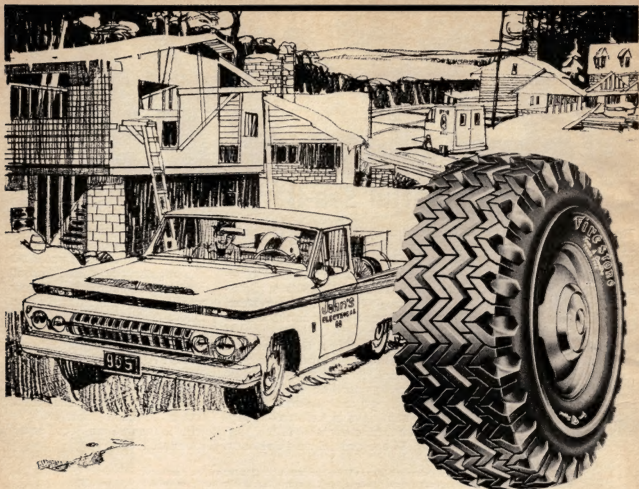
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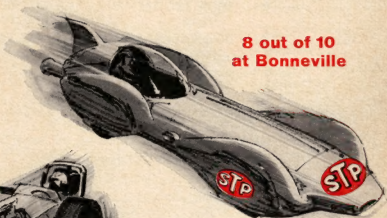
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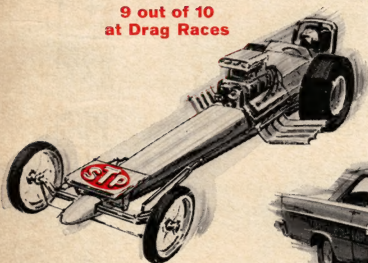
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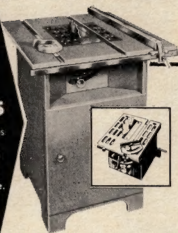
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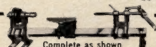
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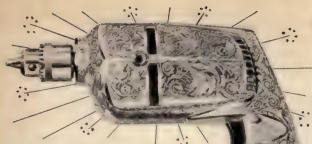
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LETTERS TO THE EDITOR

Blunder at Stone Mountain

I enjoyed reading *They're Burning a Memorial into a Mountain* (page 134, Nov. PM). It might be of interest to you to know that Gutzon Borglum had agreed to return to Stone Mountain and revise the work several years prior to his death, but funds were not available at that time.

I should like to comment on the statement that Borglum committed a blunder in transferring his designs to the side of the mountain and they had to be removed.

I have some knowledge of these matters, am very familiar with the whole Stone Mountain story, and for several years did the engineering on The Rushmore Memorial—and completed the project after the death of Gutzon Borglum. It is the only successful mountain carving in the country today.

The methods used to enlarge the models on Rushmore were basically the same as those pioneered at Stone Mountain by Borglum. Since they were completely successful at Rushmore and on a much larger scale (over five times the size of Stone Mountain), any distortion would be greatly increased.

There are two factors in mountain carving that must be considered. One is sunlight and the other is scale. To be effective, the sun must light the carving as much as possible, to make it beautiful. The scale must be in keeping with the size of the stone, or you get the effect of a postage stamp on a barn door.

Stone Mountain faces to the north, and about halfway down this side of the rock, it drops from about a 45-degree angle to a vertical. Anything below this point is almost always in shadow. Borglum's heads were larger than the present carving and placed above this shadow line. The basic blunder at Stone Mountain was their destruction.

Hermosa, S.D.

LINCOLN BORGLUM

Marines Are OK . . . but

It is not a fact that the *Jungle Boots* (page 139, Oct. 1965 PM) were made for the Marines in Vietnam. The boots have been adopted by the Marines. They were originally designed and made exclusively for the Special Forces of the Army—the Green Berets!

I think the Marines are great, but let's
(Please turn to page 12)

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F. W. COX, Hollywood, Calif., averaged \$150 a month spare time while training, now has his own full time TV-Radio service business. ALLAN R. TOWNSEND, Topeka, Kan., is a missile officer at Atlas ICBM site, fixes radios and TV sets spare time. R. L. WOOD, Fargo, N. D., got his FCC license and is Master Control Engineer with KXIB-TV. J. J. JENKINS, San Diego, Calif., says his NRI training is priceless. He is Frequency Coordinator for the 11th Naval District.



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LETTERS continued

not give them the credit for *my* boots.
6th Special Forces PFC. HARVE SAAL
Fort Bragg, N.C.

Likes the Big Steps

Congratulations on a very fine article in your November issue—*Three Giant Steps to the Moon*, Part 2 (page 116). As manufacturers of the giant crawler-transporter mentioned in your article, we have approved and released many articles and ads on the machine. I think we can say without qualification that yours is one of the best articles we've seen on the subject. Marion Power Shovel Co. ROBT. F. LOWRY
Marion, Ohio

Still His Favorite

I built the *Sidewalk Classic* (page 146, November 1963 PM) for my son's fourth birthday. After driving the car for almost a year, he still regards it as his favorite toy.

I made one change in the plans. In place of the pushbutton foot switch, I made a



switch of two pieces of laminated plastic and two strips of copper. It works by scissors action and is connected by linkage to the accelerator pedal.

Smithtown, N.Y. ROBERT PATTERSON

Rage in the Bay

I'm enraged. On page 102 of the November PM you describe as a "San Francisco Train" one of the new BART (Bay Area Rapid Transit) cars. I'm tired of having new or good things in the Bay Area accredited to San Francisco. I'm from Oakland.

Oakland, Calif. STEVE BAILEY
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THE EDITORS

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BY JOHN F. PEARSON
SCIENCE
WORLDWIDE

Can a computer play Ping-Pong? Scientists at MIT will try to find out in an experiment that's part of a program to develop robots that can do work in environments hostile to man. Matched with a human opponent, the computer will follow the ball with a TV camera eye and try to return it with a paddle held by a metal arm. But don't rush to buy a ticket for the contest. It won't take place for at least a year.

Cosmic rays will be used to search for hidden passages in the ancient pyramids of Egypt. American and Egyptian scientists will try the method on a pyramid called Cephron, the shell of which still has not been fully explored.

A tunnel beneath Cephron is available in which gamma-ray detecting equipment can be placed. This would record rays from space that penetrate the sandstone structure. Data processing by computers in the U.S. would determine whether irregularities, indicating secret passages and rooms, showed up on the detectors.

A high-intensity flash from an ordinary flashgun has been used by a Canadian researcher to sterilize male flies and mosquitoes. A single flash sterilized more than 80 percent of a group of small chalcid male flies while two flashes either killed the flies or sterilized them. A single flash killed 26 percent of the male mosquitoes and all the survivors were found to be sterile.

Hypnosis works best on children, especially those in the 8-to-12 bracket. That's one of the findings in an eight-year study of hypnotism by Ernest R. Hilgard, professor of psychology at Stanford University. As you grow older, your response seems to decrease.

The study also shows that men and women are about equally susceptible and that normal subjects are more hypnotizable than neurotic or mentally disturbed persons.

Stereo by satellite is a possibility for the future. In recent tests, according to NASA, a stereo signal was transmitted from earth, received by an orbiting satellite and re-transmitted back to earth with no deterioration of sound quality. Could

be that when the London Philharmonic booms into its opening concert a few years hence, U.S. listeners will be able to hear the live performance.

Sexual behavior of cabbage is being studied by a Cornell University researcher who hopes to find ways to improve hybridization techniques.

It seems that flowers from certain vegetables such as broccoli, turnip and cabbage sometimes reject their own pollen but readily accept pollen from other plants. The effective use of this characteristic, says the Cornell scientist, will result in the production of improved hybrid varieties.

Study of ostriches may eventually help out cattle in South Africa. At least that's what some scientists there are hoping. Researchers are investigating the bird to try to discover the secret of its resistance to drought conditions; it needs only a diet of green plants to satisfy all its water needs. Cattle, on the other hand, die of thirst by the thousands each year in South Africa.

First French Aero-Train is slated to start operating early this year. Supported by an eight-inch air cushion, it will glide over a platform fitted with a central guiding rail at speeds up to 125 mph. The train will connect points in the Paris suburbs.

Satellite moves a mountain. Study of some 300 photos taken over Antarctica by Nimbus I, the weather satellite, shows that present relief maps are in error. As a result, according to the U.S. Geological Survey, 10,000-foot Mt. Siple will be repositioned 45 miles further west.

A portable solar still that can collect enough water for survival in the desert has been devised by two government physicists. It consists largely of a sheet of clear plastic that is used to cover a hole about 40 inches in diameter and 20 inches deep. The sun draws up ground moisture, which condenses on the underside of the plastic and drops into a small container placed underneath. The scientists say that the yield may be increased by placing cut pieces of cactus or even polluted water in the pit.

(Please turn to page 16)



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SCIENCE WORLDWIDE

(Continued from page 14)

Cushion of air may aid the recovery of patients with severe burns. Researchers in England have devised a "bed" that consists of warm air moving upward at 5000 cu. ft. per minute. Though tests have been made mostly with animals, the bed has supported a 250-pound man.

The technique aids and speeds burn recovery by eliminating high-pressure areas on the burned skin surface and by drying the wounds and speeding scab formation. The rapid drying, say the researchers, also helps to reduce the risk of infection.

A Geiger counter no bigger than a paper clip has been developed to aid in the treatment of cancer. The device, according to scientists at Columbia University, is implanted in cancerous tissue, where it measures the action of radioactive chemicals being used against the cancer. This provides a means of ascertaining whether a given chemical treatment will prove helpful.

A toothpick is helping the San Antonio symphony find out which of its selections are the most popular. One is given, with an IBM card, to each member of the audience. The card lists the selections to be played followed by spaces that can be punched out with the toothpick. The listener is asked to punch out one of five holes, each keyed to a different evaluation of a piece of music.

A giant hovercraft is being built by an English technical college. British scientists plan to use it in Antarctica. They want to find out if the snow, icing and low temperatures in that area will have any marked effect on the powerful air flow that keeps the hovercraft aloft and propels it forward.

Antimatter matters. If your theory of the universe makes no provision for antimatter, you may be ignoring half of the objects in the sky. That's the view of Swedish scientist Hannes Alfvén, who emphasizes that elementary-particle physics has demonstrated the complete symmetry between the two basic types of matter.

Therefore, he says, "it seems logically unsatisfactory that cosmological theories should be based on the assumption that the universe contains only matter and no antimatter." For an interesting wrap-up of current thinking on antimatter, read "The Way-Out World of Antimatter" in PM (December 1965).

"Young man, be an accountant!"

from an article in Esquire Magazine

OF ALL the professions, few now offer higher incomes than the profession of accounting. And the doors to newcomers are wide open. Actually there are more fine positions available in accounting today than there are trained people to fill them.

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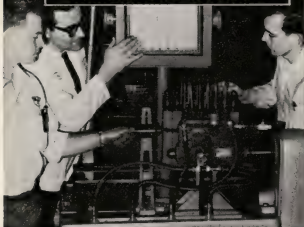
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BY KEVIN V. BROWN AVIATION JETSTREAM

Yellow airplanes? Yes, and orange, turquoise, blue, ochre and beige ones, too.

Braniff International, which flies commercial routes over North and South America, has embarked on a campaign to attract passengers by attracting attention with a heavy paintbrush.

The fuselages of airliners have traditionally been white or the natural color of the metal, with a few distinctive markings of the individual airlines. Now, Braniff's entire fleet will have solid-color fuselages with pure white wings, engines and control surfaces. The planes will look like flying cigars in technicolor. Braniff calls it "the end of the plain plane."

The redecorating extends to the planes' interiors and down the ramp to the service area and ticket counter. Even the hostesses, which is Braniff's new name for its stewardesses, have pretty new uniforms in "raspberry," "apricot-melon," "fuchsia" and "flame," topped by bellboy-type hats that tie under the chin, and bottomed out by pink boots. On rainy days the girls can cover their bonnets and heads with a transparent dome that resembles an astronaut's helmet.

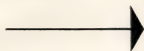
Well, only time will tell whether this splash of color will entice more passengers, but one thing's certain now. If you see a bunch of airliners on the ramp, you won't have any trouble spotting which one is Braniff's.



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CAREER BAROMETER

BY CREIGHTON PEET

EVEN IF THE BOSS is delighted with your work, you should look at your job critically—and selfishly, especially if you are only a few years out of school. Are you making the most of your native talents? Should you be moving up to better money in your company, and/or switching to a different job? Do you feel you'd do better in a different spot?

At least one authority on fitting the right people into the right jobs, Johnson O'Connor, who has spent a lifetime devising and giving aptitude tests, believes that everyone should think along these lines. If you don't, you may wake up to find you are 40, dissatisfied with your work and unable to do much about it. O'Connor tells of a young man who became a lawyer. At 35 he decided he was bored with it. So he became manager of a con-

struction firm. Not having sufficient background, he failed at this, and drifted from job to job. Now at 52 he's out of work. An aptitude test, taken when he was young, might have saved him a latter life of fear and uncertainty.

If you are jogging along in a routine job, it may be to the interest of some employers to keep you there. Finding a replacement upsets things, and it might be weeks before they can turn up a man who will do as well as you. But don't let this go to your head. What's good for the company isn't necessarily good for you.

The important thing to possess is good, solid, impersonal information about your own native abilities. This is where aptitude testing comes in. And don't confuse

(Please turn to page 24)

JOB TITLE	CURRENT DEMAND	3-MONTH TREND	STATES WITH HIGHEST DEMAND					
Chemists, Biological	21	Substantial decrease	N.J. 5	N.Y. 3	Penn. 2	Ohio 2	Wisc. 2	
Chemists, Organic	51	Slight decrease	Conn. 4	N.J. 10	Ala. 11	Ind. 4	Calif. 4	
Chemists, Inorganic	9	Good increase	Conn. 3	Penn. 1	Ala. 1	Fla. 1	Ky. 2	
Engineers, Metall.	53	Good increase	Conn. 2	D.C. 6	S.C. 10	Ind. 6	Calif. 10	
Engineers, Civil	507	Heavy increase	Conn. 31	D.C. 64	N.C. 21	Calif. 159	Wash. 31	
Engrs. Elect. & Electron	1077	Good increase	Conn. 41	D.C. 42	Md. 58	Fla. 138	Calif. 389	
Engineers, Industrial	388	30% increase	Conn. 24	N.J. 31	Ill. 28	Penn. 24	Calif. 106	
Engineers, Mechanical	1186	Heavy increase	Conn. 63	N.J. 56	Penn. 72	Ohio 61	Calif. 300	
Engineers, Aero.	397	Substantial decline	Penn. 11	Fla. 25	Mo. 60	La. 17	Calif. 263	
Engineers, Mining	10	Unchanged	D.C. 3	Penn. 1	Fla. 2	Kan. 1	Mont. 1	
Natural Scientists	74	Substantial decline	D.C. 25	Penn. 5	Mo. 5	Calif. 11	Wash. 10	
Draftsmen, Arch.	164	Very heavy increase	Mass. 6	Mich. 7	Ohio 5	Wisc. 5	Calif. 108	
Draftsmen, Electrical	184	Demand tripled	Fla. 7	Ohio 4	Ill. 5	Mo. 20	Calif. 136	
Draftsmen, Mechanical	325	Heavy increase	Penn. 39	Ohio 63	Ill. 12	Wisc. 36	Calif. 108	
Draftsmen, all other	383	Heavy increase	Conn. 16	Miss. 18	S.C. 13	Mo. 20	Calif. 227	
Tool Designers	54	Considerable drop	Conn. 7	Penn. 4	Ill. 10	Wisc. 4	Calif. 15	
Lab. Tech. & Assistants	95	Demand steady	Mass. 6	N.Y. 13	Ky. 9	Ind. 13	Calif. 8	
Sports Instr. & Officials	188	Very heavy increase	Mass. 7	Vt. 104	Va. 5	Colo. 48	Calif. 13	
Surveyors	34	Slight increase	Conn. 3	Mass. 5	N.C. 9	Ohio 3	Iowa 3	
Techs. Eng'g & Phys. Sci.	267	Slight decline	Maine 12	Va. 20	Ala. 77	Fla. 57	Calif. 55	
Tool Planners	10	Slight decline	Ohio 2	Ind. 7	Cal. 1			
System Engineers	19	Slight decline	N.Y. 4	Penn. 1	Ill. 1	Mo. 10	Neb. 2	
Programmers	206	Some decline	N.J. 18	D.C. 19	Wisc. 7	Mo. 12	Calif. 92	
Systems Analysts	48	Some decline	Conn. 3	D.C. 12	Ohio 3	Ind. 3	Calif. 15	
Inspectors, Pub. Service	23	Good increase	Md. 1	Ohio 1	Neb. 10	Calif. 2	Wash. 7	

PM's Career Barometer Chart, above, gives the actual number of men currently needed for specific jobs. "Current Demand" figures are true as of our closing date. Check this chart each month and it will tell you where your talents are needed, and how badly. For names of actual employers represented by these listings, contact the state employment agency in the cap-

ital city of the state indicated. Mention that you saw this in **POPULAR MECHANICS**.

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- "Received two promotions — worker to foreman to assistant manager." J. Swanton, Oaklawn, Ill.
- "My work piles up and I get behind with my studies." M. Bobo, Sr., Tacoma, Wash.
- "I am now maintenance man at a large hotel at a much higher salary." J. Martin, Kansas City, Mo.
- "2 raises in pay since I started with the State Highway Dept. in electrical maintenance." C. DeHut, Phoenix, Ariz.
- "Should have taken your course 20 years ago." A. Knoll, Michigan City, Ind.
- "Chief maintenance man now at double my former income besides having a profitable sideline business." R. DeWitt, McHenry, Ill.
- "One job more than paid for the training." E. Hutson, Chicago
- Former \$2.30 per hour mechanic — "Now Head Maintenance man at Halseman's Bakery — wages are nearly \$200.00 a week." C. Fontenot, Hales Corner, Wis.
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CAREER BAROMETER

(Continued from page 22)

your aptitudes with your I.Q., or the results of a College Entrance Board Exam. The first is a kind of average of all your abilities; the second a measure of your scholastic attainments. A high rating in either of these is a useful indicator of your ability to learn. But for a particular job you need particular abilities.

Aptitude tests rate you separately on 15-20 particular abilities, such as: accounting aptitude; structural visualization; finger dexterity; creative imagination; inductive reasoning; deductive reasoning; mechanical reasoning; three dimensional thinking; memory for design; proportional appraisal; tonal memory, etc.

Such tests are usually of several kinds; written, oral, physical (blocks that must be arranged or fitted together, for instance). Testers are concerned about "interest patterns." They know, for example, that a person with a good aptitude in mathematics may well show an interest in classical music. On the other hand a man scoring high in scientific interests and computational problems often will have a low score in literature.

If you make a good showing in three or four aptitudes, the testers know that you might do well in certain particular lines of work. But here Alexander Clark, Director of Placement and Career Planning at Columbia University, throws in a caution. One essential to real success in any kind of work, he says, is that you like it. You can put up a big fight and *make* yourself do a job for awhile, he points out, but sooner or later you'll be in trouble. Clark believes that enthusiasm is quite as important as having the right aptitudes. Some men, he says, will work like fury to become engineers, salesmen, or technicians, and achieve some degree of success, even though tests show them not particularly fitted for their work.

There's one aptitude which tops all others, O'Connor (and all other experts) agree. This is vocabulary—an understanding of a large number of words. Amazingly, every top executive O'Connor has tested, has had a superior vocabulary. Recently he had an interesting proof of this. A minor executive appeared for a test. Something was wrong, he said. He seemed to be performing his job satisfactorily but he wasn't getting anywhere.

His aptitude test showed that he had good aptitudes in the abilities needed for his job. But his vocabulary was limited—in fact it was terrible. He refused to believe the results of his test, and it was

(Please turn to page 26)

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CAREER BAROMETER

(Continued from page 24)

only after he had completed three tests that he would face the fact he really did have a poor vocabulary.

It's dangerous to change your line of work after you reach middle age. Employers are prejudiced. O'Connor recalls a man who found himself out of work when he was over 40. With heavy family responsibilities, he decided to become a high-powered salesman and make a pile. The first year he did, too. He led all the salesmen in his new company. But each year thereafter his sales dropped drastically. He became a recluse, and hardly left the house. In a panic, he consulted O'Connor. Tests showed that selling was the last thing he should be doing. All his aptitudes lay in other fields. Pursuing leads in fields indicated by the tests led him back to a comfortable living.

How and where do you get aptitude tests? Every year several hundred thousand high school seniors get free counseling, and sometimes aptitude tests, from the U.S. Employment Service operating through the local offices of the state employment agencies. However, such counseling is almost exclusively for boys going directly to a job from high school.

There are said to be around 20,000 people who are giving complete aptitude tests in the U.S. today. While universities do not test incoming students, many have testing laboratories, usually connected with their psychology departments. For a fee, anyone can be tested.

The "Directory of Approved Counseling Agencies," which costs \$2, can be ordered from the Am. Board on Counseling Services, 1605 New Hampshire Ave., NW., Washington DC. It lists hundreds of testing labs, by states. A complete aptitude test may cost from \$75 to \$100, and involve several sessions of a number of hours each. But it may spell the difference between your future success or failure.

Many industrial plants give what they call aptitude tests for new employees, but usually these are concerned only with the job for which you are applying. They're not much good to you personally, although they show the company whether you can do the job in hand. Other tests come later. A beginner on an assembly line looking to a better job, is often given an aptitude test, but again the company is only interested in the particular job for which he's being hired, not the man himself. Only an outside testing outfit will investigate all your potential abilities.

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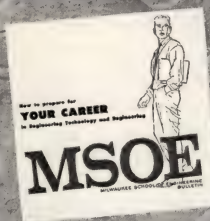
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MS-227

NEWS FROM THE **MILITARY** BY WILLIAM R. KREH

Lazy Dog is the least glamorous and simplest weapon being used by Navy carrier planes in Vietnam. Essentially, it's nothing more than a .45-cal. slug with fins. It's dropped in quantities from planes against enemy troops or small vehicles. As it falls, the fins keep it stabilized so that it acts much like a projectile from a gun when it strikes its target. For practical purposes, dropping clusters of Lazy Dogs has about the same effect you'd expect from using a huge shotgun loaded with .45-cal. slugs.

Research balloons, formerly lost after a single launching, can now be recovered and used again under a system developed by the Air Force. The system uses two parachutes—one to return the scientific instruments, another to bring down the balloon. As the balloon is deflated, its parachute creeps over it and "wraps" it in a nylon package for protection on the way down. This is done with an opening in the center of the chute, through which the balloon is pulled as it deflates. Through the hole, it passes into the protective nylon sleeve. The balloons cost from \$2000 to \$30,000 each.

Pure and portable. A small, portable water-purifying unit is now being furnished Navy photo intelligence teams operating in remote areas or aboard ship where pure water is often scarce. The photo men use about four gallons of water a minute to wash prints and the newly-developed purifying unit enables them to use the same water over and over.

Super dog, an attempt to breed a special canine that would be ideal for detecting guerrilla ambushes, may become a priority Army research project. Researchers are reviewing the characteristics needed for such a dog and biologists and animal-behavior scientists are studying the feasibility of starting such a breeding program, which Army officials think is needed because 95 to 98 percent of the dogs now offered the military are rejected.

The ambush problem in Vietnam has led U.S. authorities to seek many ways—most of them unorthodox—to help troops avoid or spot ambushes in advance. At least one such project reviewed last year called for specially-trained birds as ambush spotters.



I'll guide you step by step into your own thriving business

● While keeping your present job, would you like to gross \$12 or \$18 profit per hour?

a true story by Bob Ferrel

many things we could not afford before. My efforts were so much more productive. I scheduled my time to my own liking. When we wanted a day or two off, we took it. I worked hard but, if I wanted to be home early or quit at noon, I did.

This is not a business for a lazy man. But if a man is ambitious and will work to deserve those nice things life we want, this business is made to order for such a man.

I became so enthusiastic about this business and so appreciative of what it had brought my family that, whenever a man opened a dealership near me, I helped him get a quick start.

The company learned about this and had each new dealer in my section of Michigan spend a day with me. One day the president of Duraclean Company asked me how I would like to move my Headquarters and spend my entire time helping dealers to increase their sales and profits.

That was good news to my ears. Since then I have worked with hundreds of our dealers in their own towns and at regional meetings, conventions and dealer group meetings. But much of the time I am right here at my desk in touch with our dealers by letter and telephone.

Incidentally I sold my dealership at a good profit. Dealers sell their Duraclean businesses for up to ten times their cost. After 30 months, Leo Lubel sold for \$7,116 above his cost. If for any reason a dealer wants to sell, we maintain a service to locate buyers and help him sell.

Our job here at headquarters is to show each individual Duraclean dealer how to use his own abilities to bring him greatest success. I know hundreds of our dealers on a first name basis. We work together as one happy family. If you become a Duraclean dealer, I'll be as close to you as your telephone or mail box.

It's Easier than You Think To Build Your Own Business

If you've wanted to BE YOUR OWN BOSS... to become financially independent and have a fast growing income, now YOU CAN. And you can run a Nationally Advertised business.

You can stay at your present job while your customer list grows... then switch to full time, lining up jobs for your servicemen to do. One job a day brings a good starting income. If you hire two servicemen (full or part time) while you keep your job, the national price guide provides you a gross profit of \$12 an hour on their work and this is much easier to do than you think. We show you how... step by step. That's \$24 for a 45 hour week.

Your gross profit on three servicemen is \$18 per hour. Duraclean dealers find it easy to gross \$6 per hour on EACH serviceman plus \$9 an hour on any service they themselves render. The 24 page illustrated booklet we'll mail you (with no obligation) explains how most of your gross profit becomes clear net profit. Your income is limited only by the number of servicemen you employ.

You can operate from a shop, office, or your home. Equipment is light and portable.

At the start, you may want to render service yourself... or you can start with full or part time servicemen. This business is easy to learn... easy to start. That's \$24 for a 45 hour week. Women dealers do it. We prefer you have no experience... not have to "unlearn" old ways.

We are NOW enlarging this worldwide system of individually-owned service businesses. If you are reliable, honest and willing to work to become financially independent, we invite you to mail the coupon.

When you receive our illustrated booklet, you will see the way we show you step by step how to quickly get customers... and still more customers from their recommendations.

You have 6 superior services that are rendered "on location" in homes, offices, hotels, theaters, clubs, motels and institutions.

These are not ordinary services. You have

the prestige and endorsement of leading furniture makers and carpet mills, of Parents' Magazine and McCall's, of Research and Testing Laboratories.

National magazine advertising explains superior merits of your services, builds your customer confidence and brings job leads to you.

We and a Duraclean dealer will train you and assist you. He'll even show his successful, proven methods. You have pre-tested newspaper and yellow-page ads, commercials, and a full mailing program.

Stores, upholsterers, insurance adjusters, and decorators refer jobs to our dealers. These year-round services are in constant demand.

Start Small, Grow Big in This Booming Business

Many men have said to us, "I can't afford to give up my job till I know I have a sure thing... a sound business that will provide both security and a better living for my family."

That made sense to us so we worked out such a plan... and those same men are now enjoying a Duraclean dealership in many communities. You don't experiment. You use tested, proven methods. You have our backing and "know how."

Does this appeal to you? Don't decide now. Mail the coupon so you'll have the facts to decide wisely. There is no obligation. You'll then know whether this is what you want. You can start small and grow big. A third century ago Duraclean was an idea... but it caught fire and spread to a world wide service. Why did it spread? (1) superior processes. (2) proven customer-getting methods (3) Day to day guidance from Headquarters.

Our first service, the care of upholstery and carpets not only cleans, it enlivens the fibers... revives dull colors. Fire rises with new life. There's no harsh machine scrubbing. No soaking. Mild sponges foam lightly applied lifts out dirt, grease, many unsightly spots like magic. Furnishings are used again in a few hours.

Government figures show service businesses are growing faster than industries and stores... \$750 million yearly potential just in rug and furniture cleaning. Your 3 other services are explained in the free booklet we'll mail you.

A few hundred dollars establishes YOUR OWN BUSINESS. A day's profit more than pays the monthly payments we finance for you.

Men frequently take in partners.

We furnish electric equipment and, with first shipment, enough materials to return your TOTAL investment. If you have good habits and know the importance of customer satisfaction, you can likely qualify for a Duraclean dealership.

TODAY is the time to reserve a Duraclean dealership, before someone takes your location. It's been said, "Opportunity knocks but once at every man's door." This could be that one rare opportunity in your life.

It is surprisingly easy to learn this business. You can decide from the information we will send you whether to apply for a dealership. So, with no obligation whatever, mail the coupon TODAY. Cut it out NOW so you won't forget to mail it.

Mail this coupon TODAY It may put you in business

Duraclean Co., 6-161 Duraclean Bldg.,
Berkeley, Calif. 94705
I am interested in the 24 page illustrated booklet
telling how and why I can quickly increase my income
and family security while still employed, how you'll
help finance me. No salesman will call on me.
Name _____
Address _____
City _____ Zone _____ State _____

SOME YEARS AGO I was a printer in a small Michigan town. I drew a pretty fair pay check but it wouldn't stretch far enough to provide the kind of living I wanted for my wife and five children.

Then one day I was reading a magazine just as you now are and I saw an ad. It intrigued me. It offered me the steadily growing income I had always hoped for. It said I would have greater security and personal independence... and that's what I had been wanting.

"I was a little skeptical, but I said to myself, 'for a postage stamp I can find out.'" So I mailed the coupon. In a few days, I got a letter with a booklet that gave the whole story. It opened my eyes. I could see why owning my own business was so much easier than I had always thought... why the day to day guidance of a successful worldwide organization could assure my own success.

I read the booklet several times. It just seemed too good to be true. I talked it over with my wife. We decided that now was the time to make the forward step... there was no reason to keep postponing an income increase.

So, I applied for a Duraclean dealership and I was accepted. I stayed with my job... ran a few ads... sent some mailings... contacted a few stores and told my friends about the superior services I was now equipped to give them. Evenings and Saturdays, I rendered the service. As the business grew, I added servicemen. I found that I didn't have to develop a single idea myself. Every step had been prepared for me and pre-tested. Hundreds of other men had already proven my methods successful.

It didn't take long to see that I was making three to four times (yes, 3 to 4 times) as much per hour in my own business as in my printing job. So, after only seven months with a good following of customers, I quit my job to go full time on my own. In the meantime, I had enjoyed this extra income on top of my salary.

Each day, we realized what a serious mistake not mailing that coupon would have been... and how that little act that seemed so trivial at the time actually changed our lives. The steadily growing income brought us

Save 1/2 on New ACCORDIONS



Save up to 1/2 Off Prices of Comparable Accordions

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IMPORTER-TO-YOU PRICES!

ALL FAMOUS MAKES!

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Buy on EASY TERMS

Get in on these sensational values in world's finest Italian-made accordions! Play most popular instrument of all—for fun, leadership and profit! 40 newest models of glorious tone and breath-taking beauty offered at the amazing low prices. Buy direct from world's largest accordion dealer. Small down payment; easiest terms on balance. Extra bonus gifts FREE if you buy during sale. Trade-ins accepted. Try before you buy on FREE 5-day No-Risk Plan. Satisfaction Guaranteed or Money Back.

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See how easily you can now own and play a fine accordion. Rush coupon now for big new COLOR Catalogs and Low Importer to You Prices. ALL FREE! No obligation. Write to: **ACCORDION CORPORATION OF AMERICA, Dept. R-16**
5535 W. Belmont, Chicago, Ill. 60641

ACCORDION CORPORATION OF AMERICA, Dept. R-16
5535 W. Belmont, Chicago, Ill. 60641

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and lowest prices

Send FREE Color Catalogs and low Importer to you prices.

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☐ Check here if you have accordion.

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Handy Dandys are sturdy, plastic caps that snap into 1/8" pegboard and securely hold quarter-twist glass jars such as those used for baby food. If you are up to your neck in saved baby food jars (or you know someone who is), put those jars to work. With Handy Dandys you can make your workshop neat and clean. Perfect for storing nuts, bolts, cotter pins, washers, screws, fuses, small tools and other important items needed around the house and shop. Handy Dandys positively keeps contents dustproof. Just what you've been looking for. Put a pegboard on the back of a door for mama with Handy Dandys for buttons, pins, rubber bands, clips, stamps, etc. Have the things you need at your fingertips—inexpensively—with Handy Dandys. Sample order 12 for \$1.00; 3 dozen for \$2.50; 6 dozen for \$4.00; 500 for \$25.00. Shipped USA postage prepaid. Include payment with order—no C.O.D.'s. Order enough, you'll want more when you start using Handy Dandys. Available from manufacturer only.



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WHAT'S NEW

OUTDOORS

BY STUART JAMES

Lewis and Clark took three years to explore their famous route from St. Louis to the Pacific Ocean, and according to their journals, they faced innumerable hardships on the 3700-mile trip.

But their trials and tribulations were minor compared to the problems now involved in creating a recreation area that will follow their historic trail.

This had long been a dream of the late J.N. "Ding" Darling, famed editorial cartoonist for the Des Moines Register, and when he died a group of conservation-minded Des Moines businessmen started out to make it a reality. Last year Congress voted to create a commission to mark and commemorate the Lewis and Clark Expedition route, and Sherry R. Fisher, vice president of the Central National Bank and Trust Co. of Des Moines was named chairman.

I talked recently with Mr. Fisher, and asked how things were coming along.

"Wonderful," he said. "The Bureau of Outdoor Recreation has outlined a detailed plan for the acquisition and development of the historic, wildlife and other recreational resources along the trail, and this was accepted by the commission at a meeting we had in St. Louis in September.

"There are going to be problems, of course, but if the public response is anything like what we found in St. Louis, this trail is going to be a reality."

Here's part of the problem. The trail goes through 11 states, and it will require the cooperation of a lot of people and agencies. On the federal level alone, it involves the Department of the Interior, Corps of Engineers, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, Department of Agriculture and Department of Defense. Double this on the state level, then the local level, and then add the private ownership of lands. Now, to make this trail a reality, all these agencies must work together toward the achievement of a common goal.

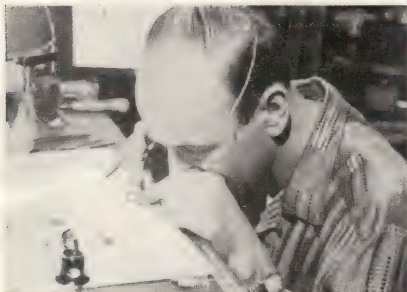
Will it work? "Absolutely," says Sherry Fisher. "This is the most exciting idea since the development of Yellowstone Park. It stirs the imagination."

I agree. And most important, if all these people can work together, it is going to be a giant step for the advancement of conservation and outdoor recreation in the United States.

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Trained, part time repairmen report earnings of \$5-\$6 an hour. This is a second income trade that's made to order. You can be your own boss . . . work where you please, full or part time. And earning opportunities now are the best in years.

You can assure yourself of lifetime income. Forget fears of strikes, automation, layoffs, or retirement. Watch repairing is light, clean, fascinating. It's work you'll enjoy. There's nothing boring about watch repairing. Every repair job is a new challenge to your skill.

DEVELOP YOUR SKILL STEP BY STEP IN YOUR SPARE TIME AT HOME

No need to leave home or job. Professional watch repairmen will teach you this trade in the privacy of your home at a fraction of what you'd pay to attend school in person. It's practical, shop method training that shows you how to repair all types of Swiss and American watches. You need no previous experience. Age is no barrier. Diploma awarded. Send today for free sample lesson and complete information. No obligation, of course. No salesman will call.

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**CSW has been training
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Address _____

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310 Lincoln Ave., Fox River Grove, Illinois 60021

DETROIT

LISTENING POST

BY JIM DUNNE

'Bird gets glandular trouble

Next year's all-new Thunderbird will look like a slightly inflated and stretched-out version of this year's model, but it will still be recognizable as a T-bird. The sharply slanting hood will definitely be longer, giving a look of thrusting power. The C (side) pillar will be wider for more rear-seat privacy. And the trunk will look like this year's—that's how small it appears.

The heavy chromed look of past T-Bird front ends is gone. Headlights will be hidden behind the full-width grille, which will have vertical bars about six inches high. Ford is taking its time developing a four-door version, but that model is said to be even bigger looking.



Wheel-less steering for Chrysler

Wrist-twist steering, pioneered by Mercury, is also getting attention from Chrysler. It's being tested on a number of cars at Chrysler's Chelsea Proving Grounds, and should show up on production models within two years, or soon after Mercury gets into production with its version. Look for wheel-less steering on high-priced cars at first.

Chev puts horse before cart

Front-wheel drive for Chevy's new Mustang-type car, the Panther: That's what the latest reports predict. Stories that this car would be out this spring have been explained away by Detroit insiders this way: The first designs made the car look almost exactly like the Mustang, and Chevy officials had second thoughts. So a completely new styling job was done, which set the introduction back to this fall. You'll be kept up-to-date in the *Listening Post* in coming months.

Car makers hold hands under table

Did you know the auto companies give their competitors samples of their new cars even *before* they are available to the public? General Motors, for instance, had 1966 Ford cars on test at their Milford Proving Grounds long before Ford dealers got them. The same thing happened at Chrysler, too. This year, Ford's Dearborn Test Track had no less than five new Toronados under evaluation the week before Oldsmobile's official introduction date. The trade usually is a straight swap—one model for one model. The advantages are obvious: Companies learn what they are up against early enough to get advertising campaigns going while the new models are still fresh, and engineers get a good look at new mechanical innovations. The auto makers also have another way of learning about competitors' products, a cut-rate one that is used frequently. Car divisions rent new cars from dealers of competing makes. Let's say American Motors wants to study the top-raising mechanism of a Thunderbird. Instead of buying a new car, they rent a 'Bird from a Ford dealer for two weeks. These cars are usually in better than stock shape when returned to the dealer, because the parts that were studied are completely hand rebuilt by skilled engineers.

Clean air costs money

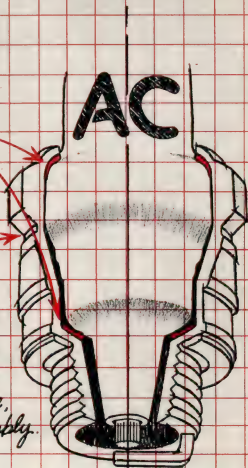
You'll pay \$18-\$45 more for your 1968 car because of exhaust-control devices. California's pioneering anti-smog program, which has forced all of the auto companies to clean up engine emissions, is establish-

(Please turn to page 34)

From an AC Engineer's notebook:

Heat-shrink bonding process assures firm seating of sealing gaskets to prevent leakage between insulator and shell.

Shell is assembled to insulator under terrific heat and pressure. As the shell cools, the metal contracts, shell tightens around insulator to form a one-piece, gas-tight assembly.



How AC's Heat-Shrink Bonding gives extra protection against leakage, helps preserve peak engine power

AC Spark Plugs are not only positively sealed against combustion gas leakage around the center electrode, but they also have gas-tight sealing between insulator and shell. Thus ACs provide you with additional protection against the power-robbing compression loss that escaping combustion gases can cause. AC's positive sealing also provides better heat conduction to help assure longer, sure-firing action. Gain the benefits of AC's heat-shrink bonding process that adds to positive sealing protection. Promote maximum power and performance in your car. Insist upon AC Fire-Ring Spark Plugs at your next engine tune up.

AC SPARK PLUG DIVISION OF GENERAL MOTORS



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Send for this free "Business of Your Own" booklet! See for yourself why this might be the chance you've always wanted to be in business for yourself. It tells the complete story about this profitable service business—lets you decide for yourself. Write today! No salesman will call.

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3333 Fifth St. N. E., Minneapolis, Minn. 55418

☐ Please send booklet on how to start a rug cleaning service.

Name

Address

City, State, Zip code

DETROIT LISTENING POST

(Continued from page 32)

ing new standards that every other state will have to follow in the near future. The federal government now has legislation on the books that sets national criteria for auto-engine emissions, standards that almost duplicate California requirements. If Washington's timetable is carried out, all cars sold in this country by 1968 will have to be equipped with both "blow-by" devices and exhaust-emission controls of the kind required in California right now. The auto industry has already said that it can have these devices ready by that time.

Dash hinges open for easy repair

A hinged instrument panel that swings out for easy access to gauges and dashboard accessories is being developed by General Motors and Ford. The biggest benefit is at the factory. As the car goes down the assembly line, the instrument panel is pivoted open. After all connections are made, the panel is swung up into position with the same motion you use when closing a glove-box door, and is secured with two bolts. Another benefit: The dashboard-windshield juncture also looks smoother.

Troubleshooting the Fords

How good are the '66 Fords? That's what Ford would like to know. For the first time it is dispatching engineers from the home office out to Ford dealerships across the country to check on the quality of new models and to get the word back to the factory quickly if anything's wrong. If this works as planned, Ford will make this a yearly practice. Then look for other manufacturers to follow suit.

Studded tires beat icy roads

Ice studs are now used on 95 percent of winter tires in some European countries, and manufacturers predict that they will eventually capture a major share of the U. S. market in winter tires. Embedded in snow tires, these small, tack-like metal inserts give exceptional bite when driving over icy roads. This winter, some two million studded tires are expected to be sold in the United States. They last about 20,000 miles, or about the life of the tire; they are recommended for both front and rear tires, since 60 percent of the braking force is on the front wheels; they damage roads only superficially, and then only during panic stops; and they are safe at up to 90 mph for long periods of time. Only 27 of the states now approve use of these tires, but more of them are expected to give their okay soon.

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Just getting started in industry? Being by-passed because you're not up on new industry methods? Don't let technical progress — automation — pass you up. Let an N.T.S. Project Method Home Training program help you **MOVE UP FASTER, MAKE MORE MONEY!**

N.T.S., a leading technical school for over 60 years, **shops every lesson and manual.** Easy-to-follow, fully-illustrated lessons help you learn fast. Look over these big-opportunity home study courses. Choose your field! You'll soon be on your way to a high-paying new career.

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Train yourself easily, quickly for America's "big future" industry!

4. Radio Servicing (AM-FM-Transistors)
5. Television Servicing (Including Color)
6. Stereo, Hi-Fi and Sound Systems
7. Basic Electronics
8. Electronics Math



AUTO-MECHANICS DIVISION

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3. Diesel Mechanics
4. Engine Tune-up and Electricity

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Dept. 201-18

AUTO-MECHANICS DIVISION

- ☐ Automotive-Diesel Master Course
- ☐ Automotive Mechanics
- ☐ Diesel Mechanics
- ☐ Engine Tune-up and Electricity

AIR CONDITIONING-REFRIGERATION DIVISION

- ☐ Air Conditioning-Refrigeration Servicing Course
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Electronics training opens a world of interesting high-pay jobs. Fully illustrated lessons, shop manuals and schematics teach you quickly, easily. **BIG EQUIPMENT KITS** come with many of the electronics Project Method courses — **AT NO EXTRA COST, NO KIT DEPOSITS.**



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You get the **TOOLS, TESTERS, EQUIPMENT** you need — with **NO EXTRA CHARGE, NO KIT DEPOSITS.** Learn about compressors, condensers, evaporators, gas and electric air conditioning. Covers auto and bus air conditioning as well as home and industrial. If you want to start your own business, N.T.S. provides valuable, practical help.



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If you win the art scholarship prize, you get the complete course in commercial art taught by America's largest home study art school, Art Instruction Schools. You will receive personal attention from professional commercial artists in the fields of advertising art, illustrating, cartooning and painting.

Even if you do not win, you will get a professional estimate of your talent without cost.

Entries for February contest must be in before February 28, 1966. None can be returned. Our students and professional artists are not eligible. Mail your entry in right away!



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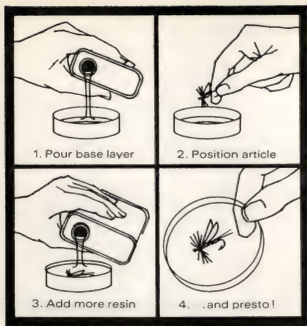
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JAN. 1966



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QUESTIONS ANSWERED

HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Out, Out, Darn Spot!

Drippings from a colored wax candle have stained my linen tablecloth. When I tried pouring boiling water on the two stain spots, the wax disappeared but not the stains. I do hope you have some magic formula for removing these stains.—N.H., Texas.

Sad to report, my magic wand is in for repairs just now. But I doubt if waving it over your problem would do much good anyway. I have a sinking feeling about that boiling water you poured on the stains; I'm afraid that may have "set" the stains for good. You can give it the old college try, however, with that old standby, lighter fluid.

Spread the stained area of the tablecloth over several thicknesses of clean paper towels on your (clean) kitchen table. Apply the solvent to the stains a little at a time, then immediately rub lightly with a clean, folded paper towel, working from the edge of the stain toward the center.

Another type of solvent which often removes stains from white fabrics is a jelly-like compound called "Quickie" which painters use to remove paint from their hands. Apply this stuff to the stains with your fingertips, allow it to "work" for a minute or two, then wash it away with a soapy solution followed by a thorough rinsing with clear water. Note: don't use this stuff on dyed fabrics.

Some "Drips" Are Creaks

Whenever I draw hot water from either the kitchen or bathroom faucet I hear a noise that sounds just like dripping water. I've searched everywhere but can't find any sign of a leak. Since our home is a new one, I'm very puzzled by this dripping sound. Can you suggest the cause?—D.L., Tenn.

This is a toughie, but I'll hazard a guess. First, I'll assume you're right about that invisible "leak": there isn't any. Hence, whence the "dripping" sound?

Look for a long run of hot-water line and find where it passes through any openings in the walls. Set up a listening post at these points, then have someone turn on the hot water. It may be that a

(Please turn to page 40)

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HOMEOWNERS' CLINIC

(Continued from page 38)

slight expansion of the pipe occurs when the hot water flows through it, and that this is enough to cause the pipe to creak against the sides of the opening in the wall. The cure? Enlarge the opening slightly using a sheet of sandpaper wrapped around the pipe grit-side-out, then work it back and forth against the sides of the hole.

To Fur or Not to Fur

I want to panel one wall of our kitchen-dining area with 4x8-ft. grooved panels. It's a house-side plaster wall in good condition, covered with wallpaper. Can I apply the paneling directly over the papered surface without furring, or must furring strips be installed?—B.Y., Mass.

Horizontal furring strips are recommended if the panels are the type that are nailed only at the seams where one panel joins another (otherwise you might have trouble getting the panels to "break" right for nailing to the studs). When nailing the furring into the studs, install one strip at the ceiling, one at floor level and at least two at equal distances between.

If the panels are a type that can be nailed at any point, then forget about the furring and set 'em up against the wall and nail 'em directly to the studs.

Don't bother removing the wallpaper.

Her Plants Quit in Winter

This is the second winter I've tried to keep plants indoors—without success. After a month or so the leaves lose their luster and drop off, and I can't seem to bring the plants back to bloom. I must be doing something wrong.—U.L., Nebr.

The symptoms you describe are usually due to insufficient humidity. The best way to overcome this problem—especially if you keep all your plants in one room—is to install a small humidifier and keep the door to the room closed.

Or place the pots in large shallow pans half filled with small pebbles to help maintain about a 1/2-in. water level.

Most plants require plenty of sunshine, so be sure they're near a window where they can get it, and turn them frequently.

Periodically spraying water on the foliage will help prevent leaf drop. Stir the soil in the pots occasionally, too.

Finally, consult a local nurseryman for advice on what nutrients your plants might require to enable them to flourish. ★ ★ ★



TOM McCAHILL SAYS:

**"A lot of people
could make themselves
valuable FAST"**

Everyone talks about high school dropouts and automation changing jobs and what to do after retirement. I know some full grown high school students who can't find summer jobs. I have known family men who thought the end of the world had come when the plant moved out of town.

I hope this doesn't sound like a two-bit sermon, but there are solutions to remedy almost any situation. A lot of people could make themselves valuable fast in a job field that nobody seems to know much about—yet, and that's fixing electrical appliances.

As you know, the day is long past when the average home had only one or two electrical appliances. Most homes today are loaded with electrical gadgets that are used for everything from drying milady's hair to cooking dinner and cooling or heating the house.

These appliances break down and that's where you come in.

Appliances have become a major part in our living habits, and in most areas, good appliance repairmen are as scarce as old maids in Corvettes.

What makes sense about this field is that it offers opportunities to men of any age. You'd be surprised at the extra income you can pick up doing good appliance servicing for your neighbors—or the possibilities of starting your own business with little or no investment. There are also good jobs to be had working for some one else who's already in the business.

How easy is it to break into this field?

A lot easier than you think, if you take a look at

the home-study course offered by the Appliance Division of the National Radio Institute. You've probably seen the NRI ads. They've been one of the biggest and best schools around since 1914.

The course is good. It's easy. It costs less than many people shell out for one month's payment on that Detroit monster parked in the driveway. They train you fast, in an interesting way, to do some real *professional* appliance servicing on just about every type of appliance from small to large, including most farm and commercial appliances. It even covers small gasoline engines. And they have a separate arrangement to teach you air conditioning and refrigeration.

The point I want to make is this: About the worst thing anyone can do is to sit down and worry about where the extra bucks are coming from. It's not good for your digestive system. It isn't good for those who have to live with you. About the best thing any man can do is help himself.

Do a favor for the guy you see in the mirror every day. Get the details about this course. They send you some books that are worth reading—FREE. Send the coupon below or drop them a note.

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Spotlight On Dodge's New Fastback

By Jim Dunne



**This Coronet in wolf's clothing
will be out stalking Mustangs.**

IT HAS A FASTBACK ROOF, retracting headlights, rear seats that fold flat to form a deck like a station wagon's, and it boasts Chrysler Corp.'s first flow-through ventilation. "It" is the new four-seater Dodge Charger, which goes on sale this January.

The car may share its 117-inch-wheelbase chassis with the Dodge Coronet, but its interior is strikingly different. The instrument panel is new, and the headliner is made of one-piece fiberglass.

Station wagon in disguise

With the rear bucket seats pushed forward and a security panel folded back into the trunk, there's a flat luggage space—like the one in the Plymouth Barracuda—roomy enough for you to position two air mattresses side by side, 76 inches long in all.

With security panel up, length is cut to a bassinet-size 36 inches. Either of the rear seats can be folded forward individually, leaving room for three passengers, while still providing extra utility space.

But Dodge could have made better use of all that room. For one thing, the floor of the storage compartment begins about

12 inches behind the back of the front seat, leaving an inconvenient gap. Small articles tend to fall in. And there is a difference of about six inches between the levels of the trunk floor and storage area inside the cabin, which would make overnight sleeping a backbreaker.

People-room is adequate

The car is roomy enough to carry its designed load of four passengers in complete comfort. Back-seat headroom is adequate even with that sloping roof, but leave your hat home whether you sit in front or in back. All these new cars are hatmakers' enemies.

The back-seat arrangement is especially comfortable. An arm rest for both passengers is formed by the padded control console that runs the full length of the passenger compartment. Of course, you pay a penalty for this comfort: You can't seat a fifth passenger.

Charger road handling is similar to that of the Coronet two-door, even though the fastback has a higher center of gravity (the culprits are the big rear window and long roof). Lean isn't too acute in sharp turns. The combination of a 383-cu.-in. engine and automatic transmission makes for alert and responsive performance. Most of the Coronet options are being made available on the Charger as well,

(Please turn to page 44)



I'd like to give this to my fellow men... while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is rubbish! And anyone who tries to tell you that you can think your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be earned! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain. If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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DODGE'S NEW FASTBACK

(Continued from page 42)

including the 426-cu.-in. hemi engine.

The rotating headlights mentioned earlier are housed in a diecast chrome piece that also serves as part of the grille when the lights are hidden. The small electric motors that turn the lights are geared down 450:1 to ensure reliable operation even in icy conditions. A push-pull light switch turns on the lights and rotates them as well. If the headlights are not in proper position, a red dash light warns the driver. A separate switch allows the driver to keep the headlights in aimed position even when they are turned off. Also, they can be manually rotated in case of power failure.

Let there be light

The full-width taillight has six bulbs, all of which light up when the headlights are turned on and brakes applied. Turn signals flash a bank of three lights on one side of the lens.

A large box section in just behind the rear window contains a plenum chamber for exhausting air from the passenger compartment through two large vents covered over by rubber flaps. These flaps act as one-way valves to keep dust from entering.

The futuristic rear window is a tipoff on things to come; the glass is curved up at the outer edges in gullwing fashion. Look for other cars to pick this up soon.

★ ★ ★



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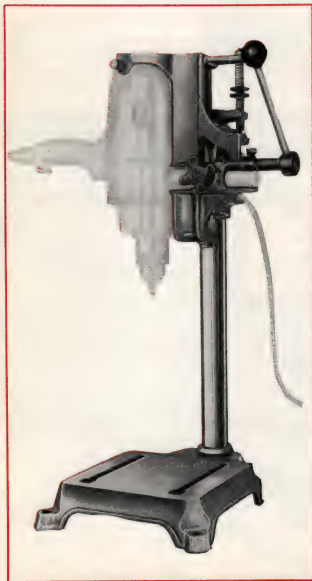
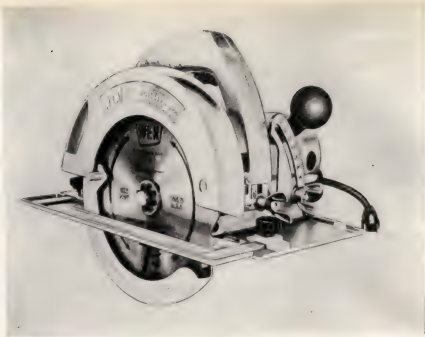
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New From Wen



WITH THE INTRODUCTION recently of two new industrially rated 7¼-in. circular saws—the heavy-duty Stallion 1000 and the Stallion 960—Wen Products, Inc. rounds out its line of economically priced portable power tools. Both are rugged items that appear to incorporate safety with stability, and to provide a nice balance that insures proper ratio of down/forward cutting force at all cutting depths and angles.

Designed primarily for commercial work, the 12-lb. Stallion 1000 (shown above) features a 2½-hp, 12-amp air-cooled motor with a no-load running speed of 5300 rpm. Frictionless ball and needle bearings are used throughout. It sells for \$54.95.

The Stallion 960 is a made-to-order tool for the homeowner-handyman-craftsman. Its 1¾-hp, 10-amp. burnout-proof air-cooled motor turns at 5200 no-load rpm on perpetually lubricated needle bearings. This one weighs about 11½ lbs., sells for \$44.95.

Both saws feature low profiles and low centers of gravity and come with a 7¼-in. alloy steel, chrome-plated blade and a ⅝-in. round arbor. A safety clutch on each prevents kickback. A zero depth adjustment permits setting the blades from zero to a 2½-in. cut at 90° and 1⅞-in. at 45°. Of course, both will plow, groove or dado.

Wen's new drill-press stand (right) is the companion tool to its four-speed reversible ½-in. All-Drill, introduced last year. Made of heavy aluminum and steel, the stand permits the drill to be clamped snugly and securely to it in seconds. This goodie lists for \$35.95. ★★★

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It's one of the first production hydrofoils using outboard power. Like a Volkswagen, it's so ugly it has "character." And like the famous beetle, it uses a minimum of power, a minimum of fuel, and is surprisingly maneuverable.

The "Water Spyder" lifts two adults in a fast cruise some 14 to 18 inches above the surface. Its stilts are two hydrofoils fastened to the hull and a rear stabilizer that projects behind the craft. From the pod-type cockpit you operate a control handle that alters the angle of the stabilizer only 5°, but this is enough to bring the craft up on its foils.

The Spyder will take any long-shaft motor from 20 to 35 hp. Actually, the horsepower within that range makes little difference. Once it's up on its aluminum

foils, the craft will scoot along at 40 mph with a 20-hp engine as easily as with a 35; at full speed the *total* surface touching the water is only 15 square inches (less surface than the palm of one hand), and it doesn't take much power to keep it moving at top speed with such little drag.

The water bug is 12 feet long and 7 feet 4 inches wide, including foils. For docking or trailering, the foils are pivoted up and locked against the fiberglass hull. Exclusive of motor, the craft weighs only 180 pounds.

Its performance is surprising. Not only will it stand up on its stilts in a hurry (four seconds with 35 horses), but it can be whipped around in a 35-foot turning radius without dropping back into the water.

The Spyder retails for \$970, complete with upholstered seats, lights, speedometer, windshield and steering hardware.



GETTING UNDER WAY, designer Lstiburek's sleek little craft looks like a conventional runabout, except for that extra plumbing hanging from the sides



CLIMBING to a planing attitude as power is applied, the foil struts kick up a fine spray. This disappears once the hull breaks free of the water



high-speed boating

A larger model, available by the time you read this, will be 19 feet long and will lift six adults. Designed for any motor in the 60 to 100-hp class, it also will have a maximum speed of 40 mph. It will retail for \$1800, or the equivalent of \$300 per seat for the ride of your life and the privilege of being the focal point of every boater's eyes this side of the horizon.

Designer of the two Spyders is Joseph Lstiburek, who has had years of experience in designing aircraft components, experience that obviously shows in his first two hydrofoil boats.

The firm (Water Spyder Marine, Ltd., 157 Richard Clark Drive, Downsview, Ont.) soon will offer a kit of hydrofoils—not the first on the market, by the way—with complete instructions for installing them on any planing-type hull. If these catch on, watch a good many boaters become airborne.—Clifford B. Hicks



EVERYTHING FOLDS up snug to the hull so that the tiny flyer can be transported on a normal boat trailer. The stabilizer swings over into the cockpit



FLYING above the surface on its foils, the pod picks up speed rapidly. Running flat out, the boat rides on only 15 square inches of the foil surface

FROM THE PATENT OFFICE

NEW INVENTIONS

BY M. J. PEDERSEN

A floating runway of around 200 by 40 feet may one day zip in and out of busy harbors, carrying ready-to-fly airplanes as passengers. Equipped with jet engines, the hydrofoil runway would skip along the surface, reaching speeds of 100 mph or more. It would whisk from port only one loaded airplane at a time and, while speeding along, allow the plane to take off from its deck. Receiving patent 3,191,566, Fred H. Wilken and Herman Roberts, Demarest, N.J., noted that the aircraft cannot overshoot or undershoot the runway because the hull forming the runway travels with the aircraft for landing or takeoff.

Floating fuel station, connected to a shoreline supply tank, may enable boaters to "fill 'er up" without chugging all the way back to shore and the crowded boat docks. Jerome H. Mandel, Forest Hills, N.Y., received patent 3,190,495.

Supermarket aisle traffic regulations:

Speed limits, stop signs and perhaps even a traffic light at the intersection of the meat counter and the frozen foods bin? It's not as far-out as it may sound, what with a new motorized grocery cart that incorporates a throttle and a steering mechanism in its handle. To allay male fears concerning reckless women drivers, it should be added that the cart does not exceed normal walking speed. Moreover, the motor stops as soon as the throttle is released so there's no danger of a run-away cart. James H. Swinny of Natchez, Miss., received patent 3,190,386.

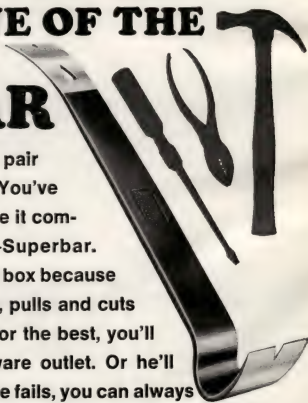
Surgeons' dirty hands can be cleaned in 30 seconds by an alcohol and abrasive cleaning machine that earned patent 3,205,620 for Harmon H. Woodworth, Los Altos, Calif., and Peter M. Newgard, Redwood City, Calif. A motor in a tank of alcohol drives abrasive particles such as sand through jets at high velocity while the doctor holds his hands under the stream.

Preventing cannibalism by means of separating little fish from the big ones is one advantage of an apparatus for grading young live fish that earned patent 3,204,605 for Paul E. Vroman of Philomath, Ore.

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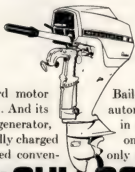
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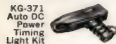
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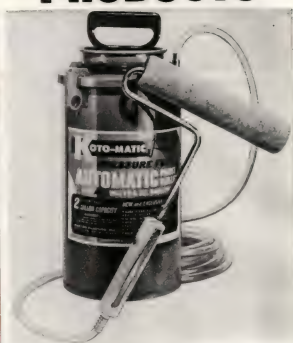
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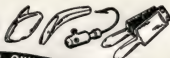
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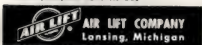
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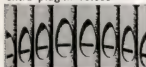
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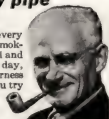


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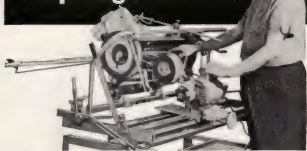
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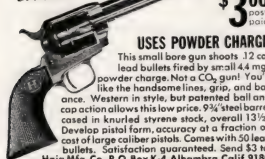
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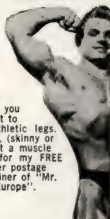
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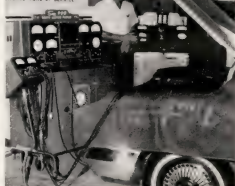
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Our new Sixes are messing up the Ford V-8 image! Great!

For years "Ford V-8" has meant powerful performance. Smooth. Responsive. It still does.

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you get in an engine. And you get it with either a Ford Six or Ford V-8.

Our smoothness in engines is matched by smoothness in ride. Ford's Twin-I-Beam suspension sees to that. Two front axles work independently to absorb road shocks. At the same time, they hold wheel alignment and reduce tire wear.



Big . . . powerful . . . economical . . . smooth? Somehow we kind of like this image.

FORD/66

EDITOR'S PAGE

Suburba-Car contest entrants sent our Shop and Crafts secretary, Carol Schultz, to the Virgin Islands for New Year's. She said she needed a rest after handling the deluge of mail that left her awash in car body designs. They ran the gamut from crayon drawings to precise engineering elevations. The contest, announced in November PM, closed at midnight on December 20, and it looks like a tough decision for our panel of judges who must reach a verdict in time for our March issue. Meanwhile, the chassis (with wheels below), has been put in top running order for the winner. The people shown in the Suburba-Car are Alan Flowers and a friend. He's one of the inventors, and is now designing cars for Ford Motor Co. Co-inventor Bryan Skogler is designing cars for General Motors.

It's a frosty dawn for taxidermy nowadays, we hear. The news is that, instead of skinning things like snakes, rabbits and birds, then stuffing them, for those exhibits in the natural history museums, they are freeze-drying them in the exact position needed for the dioramas. The specimen is shaped by hand; the taxidermist uses liquid nitrogen to freeze local parts in place, then puts the pre-set specimen in the deepfreeze to harden. Finally he puts it in a freeze-dry chamber where it becomes a permanent natural statue. You can read the details in next month's P.M.

"It's great to be rich," according to Alex Markovich, our New York auto editor, who test-drove some of the world's most expensive cars for the luxury car story on page 94. "There's this Cadillac driver down the street," he told us, "who wheels past my house every morning about the time I'm leaving for the office. Well, he'd always gone right by without glancing in my direction—until the morning I had that Rolls Royce in my driveway. He came past on schedule, but off script—



obviously hit right smack in his status. He nearly left the road while swivel-necking; his eyes looked like a pair of alarm clocks, and his lower jaw was on the floorboards." Alex's third-grade son, however, wasn't nearly as impressed when he found the Rolls waiting to pick him up at school. His classmates stared and scratched their pates, but all young Markovich wanted to know was: "Can it burn rubber?"

The picture at the bottom of this column was captioned "What do I do now?" when it hit this desk. That's what our astute outdoors editor, Stu James, asked the photographer who was taking pictures of him "at work in the field" for a series of PM ads. Here's how it happened, according to Stu: The photographer was in position and our editor began his bird stalk. He moved with careful, deliberate steps, shotgun poised—the classic picture of a hunter stalking a ringneck pheasant. Spotting a bird in the brush, our man tensed, ready for the split second of exploding flight. But the silly bird hadn't read the script. He walked up to our "hunter" like a curious penguin, pecked at his boots, circled him once and then flapped up like a chicken homing in on a roost to perch on Stu's shoulder. "And that," our expert explains somewhat lamely, "is a very difficult shot, believe me." We have to believe him. You don't.



Supersonic Transports— Too Fast for Comfort?

By Thomas E. Stimson

The pilots fly blind, the passengers eat cold meals and on some flights they'll land before they take off.

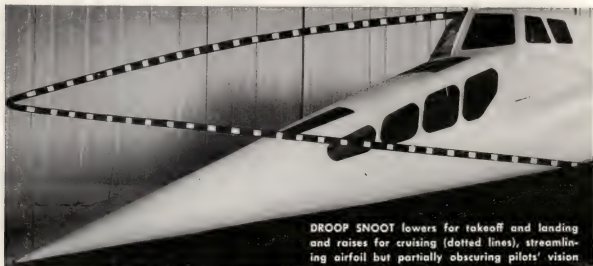
THE AIRLINE'S CHIEF PILOT was sitting in the mock-up of a supersonic transport, peering through the windshield at the craft's long needle nose that drooped down in front.

"Now," said the factory technician, "we'll raise the nose to cruise position." He pressed a button and the nose crept up over the windshield. It was almost like raising a blackout curtain in front of the

cockpit, partially obscuring his vision.

"You mean," the chief pilot demanded, "that my pilots will be flying blind at 1800 miles per hour with 250 passengers if we buy this thing?"

"Not entirely," was the answer. "The pilot has quite a bit of vision overhead and through the side windows in the nose. He can see the weather; he can always see the horizon.



DROOP SNOOT lowers for takeoff and landing and raises for cruising (dotted lines), streamlining airfoil but partially obscuring pilots' vision

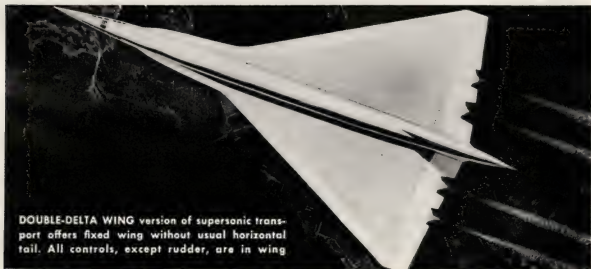


PILOT'S EYE VIEW from cockpit of supersonic transport. When nose is up during cruising, his vision is partially obscured (left). When nose is down for takeoffs and landings (above), he has normal vision. Instrument panel will also dispense with round dials, displaying information on moving tapes

"Even with complete forward vision he'd never see another aircraft in time to avoid it. So the SSTs will have their own flight corridors, with no other traffic. There will be no need to maintain a sky watch. When the pilot is descending for a landing he'll simply rotate the nose down again, exposing the windshield. This gives him all the vision he needs."

All the European and American SST

designs are using the "droop snoot" or some variation of it. No better way has been found to protect the windshield at high speed. The friction of the cold air blasting against the windshield would raise the temperature of the glass above 500°, creating a number of problems. Besides, the mere drag of the unstreamlined windshield would "cost" 12 passengers on every trans-Atlantic crossing if it were



DOUBLE-DELTA WING version of supersonic transport offers fixed wing without usual horizontal tail. All controls, except rudder, are in wing

to be left exposed at supersonic speeds.

The windshield is only a sample of the problems being encountered—and solved—by the engineers who are designing aircraft that will hurl passengers from New York to Paris in three hours, or New York to Los Angeles in less than two. To begin to get an idea of the forces involved, consider this: The four engines of a 250-ton SST will produce more than half the thrust an Atlas intercontinental rocket!

Now that the United States is well along in designing supersonic transports, an international race is developing over which country will get its plane into service first. It's a race in which the United States is likely to come in last and still win first prize.

The Concorde (French-British) may begin carrying passengers in 1972. The Russians are shooting for the same year. Not for an additional 24 months or so, probably, could the U.S. entry be in airline service.

So how could the United States win first prize?

The answer is that the American entry (or entries) will be faster and larger, and the airlines have learned that passengers won't take a slow plane if seats on a faster one are available. Too, the larger aircraft are more comfortable and cost less to operate per seat-mile. Those are reasons why the U.S. entry is expected to outsell its competition and win first prize.

The Concorde will be red-lined at Mach

2.2. (1450 mph at 60,000 feet) because its aluminum structure would literally wilt from aerodynamic heat if it flew faster. The Russian SST is judged to be of aluminum too; hence it will have the same speed limit.

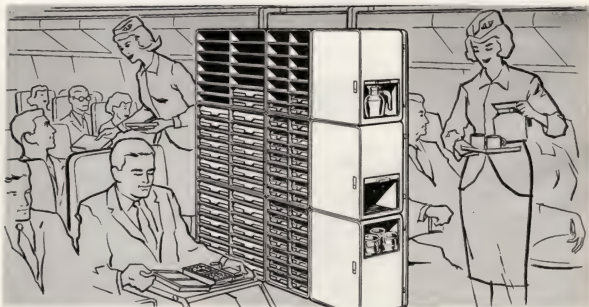
But Boeing and Lockheed, the two companies competing for the task of building America's entry, have gone a step farther. Each has developed new techniques for fabricating titanium, a stubborn metal that is far more resistant to heat than is aluminum.

Result: Each company plans a titanium aircraft that will cruise at Mach 2.7 at the start (1800 mph at 60,000 feet) and that can "grow" to 2000 mph with larger engines.

All this has brought on a bit of "gentlemanly" trans-Atlantic bickering. The Concorde people, for instance, suggest that neither U.S. design is good enough to have won government support. Fact: Each design looks so good that it's hard to decide which is best, and so more research money has just been granted both companies.

Too, the Europeans say that the United States started to design a 2000-mph aircraft, then had to compromise on a slower one "because of the unknowns in little-known metals that have been tested only modestly." Fact: We settled for 1800 mph at the start because the engine builders need more research time for designing even faster engines.

In turn, more than one U.S. engineer



FOOD SERVICE in 250-passenger plane traveling at 2000 mph is another problem. Food cart on overhead trolley is one solution. Each packaged unit can be supplemented with hot item by stewardess on spot



CABIN INTERIOR emphasizes tunnel-like construction. SSTs will be longer but narrower than current subsonic jets. Seats, five across, will be smaller and lighter but provide more space for each individual passenger

feels that the Concorde may encounter problems that could seriously delay its optimistic schedule. For one thing, they don't like the way that the Concorde maintains stability when going supersonic. It's done by pumping a great deal of fuel from its forward tanks to tanks in the rear. American engineers don't think this is the best solution to its trim problem.

They are disturbed, too, by the way its designers grouped the Concorde's engines. There's a single nacelle under each wing, with two engines side by side in each

nacelle. Some weight is saved, yet there are serious objections:

- It is hard to start the second engine in a nacelle because the one already started is grabbing most of the available air. There are ways to solve this, however.

- If one engine in a pair goes out during supersonic flight, a shock wave builds up in front of it (because the air is blocked) and the shock wave drastically cuts the power of its companion engine. Drag goes away up, thrust goes away down, all on one side. The result could be a violent yaw and this might be disastrous.

- The shock wave may beat the nacelle to pieces, producing a complete loss of power on one side. The name for this condition is "inlet buzz."

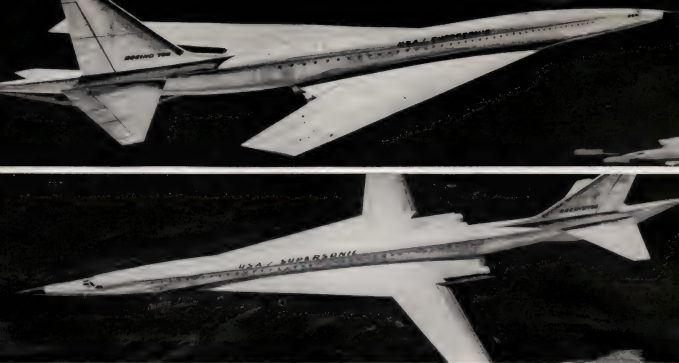
- A fire in one engine could spread to its companion.

Those are reasons why both American companies have isolated each engine in a separate nacelle. They feel this is by far the safest arrangement.

However, there is some controversy—call it difference of opinion—between the U.S. competitors themselves. Boeing favors a variable-sweep wing for the SST, while Lockheed is betting on its double-delta wing. Each company has spent millions in company funds (in addition to federal millions) on basic research, wind tunnel models and mock-ups. Each has appointed an engineer as "sales manager"



COLD FOOD, literally a box lunch stored in each seat back, is another solution to food problem



VARIABLE-SWEEP WING version of supersonic transport will extend wing for better control during takeoffs and landings and sweep wing back for transonic and supersonic flight. Both this and delta-wing version have backers in runoff competition and some say there is room for both versions in supersonic age

to help convince the airlines and the FAA that his company's design is best.

To learn why the different philosophies exist, *PM* went direct to the companies. We interviewed William C. Becker, supersonic transport sales manager of the Boeing Co., and P. A. Colman, director of sales, supersonic transport, Lockheed-California Co.

Here's what Bill Becker says: "The Boeing SST is an efficient subsonic aircraft with its wings extended, and becomes an efficient supersonic aircraft with its wings folded back. It can take off and land in appreciably shorter distances than a 707 or a DC-8 and is no more complicated to fly than the present jets.

"The wing joints just happen to be movable joints instead of fixed joints. They are rotated through 52° by means of screwjacks. We've operated a test joint, under load and in hot and cold environments, through 18,000 cycles with no signs of fatigue. Even if the wings could not be swept forward to land, the aircraft could be flown subsonically with its wings folded back and landed in distances not exceeding field lengths available world wide."

In turn, Phil Colman summarizes his company's approach: "The Lockheed L-2000 configuration is the simplest approach to SST requirements, which means greater safety and lower maintenance.

The double-delta is efficient and aerodynamically stable in both the subsonic and supersonic speed ranges without the use of a horizontal tail or the transfer of fuel.

"The wing is called a double-delta because it starts as a narrow delta or chine just aft of the cockpit and then, part way along the fuselage, broadens to the full delta shape. It's a big wing. Its maximum angle of attack is less than halfway to the stall angle. Takeoff and landing speeds are comparable to the present jets."

Expensive as it would be, the industry would prefer to have both designs built and flown. That would be the best way to determine which is superior. The fact is that the SST market is beginning to look so large that there may be room for building both in quantity if some airlines like one design and other airlines prefer the other.

Little details that seem silly today will suddenly become important in the SST age unless they are solved ahead of time. For instance, what's the best way to clean the ashtrays in the cabin? This has been the subject of serious research. It's important because the cleaning of ashtrays (including chewing gum and paper stuffed into them) is the most time-consuming part of cabin housekeeping; seconds count when turn-around time on the ground may be no more than half an hour.

(Please turn to page 206)

Vacation house that can travel

COMPLETELY SELF-CONTAINED and maintenance-free, a new type of vacation house introduced by Outboard Marine Corp., is designed to mount on screw jacks with minimum site preparation.

Produced in cooperation with Alcoa, the walls are laminated sandwich panels of aluminum and foam plastic locked together with Alcoa's Snug-Seam joining system. The inner surface is covered with vinyl, while the outer surface has a baked-on enamel finish. The one-piece roof is a molded fiberglass sandwich panel.

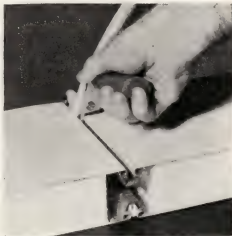
The 10 by 14-foot Deluxe Hideout features built-in facilities to meet all water, fuel and waste-handling requirements, and sells for \$3685. A Spartan camper version lists at \$2985.—*Art Mikesell*



PORTABLE HIDEOUT weighs between 2500 and 3000 pounds, moves on flatbed trailer



CAMPER MODEL has 5 by 10-foot bunk above convertible sofa. Telescoping table shown in "up" position is extra-cost option



HOOKEDEDGES of panels first slide into extrusions, then are locked in place and sealed tightly with neoprene strip gaskets

HOW PLUSH IS A *Luxury car?*

*These are six of the cars the rich people drive — —
and here's why they cost from \$5000 to \$20,000 more*

By Jim Dunne and Alex Markovich

Rich smell of wood and leather . . .

is an important part of the Rolls-Royce's appeal. New Silver Shadow, at right, was not available for testing, but should be sold here soon. Styling and engineering are modernized. Most prominent feature of Silver Cloud (farther right) is massive radiator with finely sculptured and detailed ornament. Many purists groaned when Rolls switched to quad headlights recently; we were undecided about the aesthetics, but had to admit that lighting is improved. Front armrests (far right) can be adjusted up and down



Cushiest seats on wheels . . .

are in the Mercedes 600. Double exposure shows how the driver's seat is adjustable six ways to fit anyone from two to twelve feet tall. Reclining rear seat has adjustable headrests. Headroom and legroom are fine except for prominent floor tunnel. Draw drapes on rear and small side windows give privacy, if desired. On a winding country road, set the shocks on "firm" and corner with wild abandon. Lean is negligible, and wheels stick to pavement like glue, thanks to the air suspension



“WHY, YOU CAN practically buy a house for that kind of money,” a neighbor observed as he looked over the \$20,500 Mercedes-Benz 600 in the driveway.

Why would anyone spend this kind of money and even more on a car? Especially when the ads tell you, in effect: Put air-conditioning, stereo music, power seats, power windows and tilt steering on a Galaxie and you have all the luxury you could want. To find out, we drove six of the world's most luxurious cars—Cadillac, Imperial, Lincoln Continental, Jaguar 4.2 Mk X, Mercedes-Benz 600 and Rolls-Royce Silver Cloud III.

For one thing, plenty of extra items on the big cars still make them more comfortable than anything else on the road. Things like Cadillac's “hot seat,” which warms your posterior; Lincoln's automatic tem-

perature control; Imperial's bench-type split front seat with individual six-way power positioning. Then there are television sets, automatic headlight dimmers, variable-ratio steering, automatic leveling devices, adjustable reading lights, more passenger room. True, some of these features are already available on lower-priced cars, but by '67 luxury cars will offer still more exclusive goodies.

The foreign luxury cars offer much the same features as do the U.S. ones, but in even more polished form. The power windows in the Mercedes rise so fast they practically snap to attention. Mercedes and Rolls allow you to vary shock-absorber settings—and hence ride stiffness—with the flick of a dashboard switch. In addition, the Mercedes air suspension allows the car to be raised via a dash switch for



World's biggest sedan . . .

is still Imperial, which tops the field in length, and ties with Cadillac in width. Its interior is plushiest of the U.S. cars, featuring individually adjustable seats with ornate embossing and optional headrests. Fine wood and carpeting add to luxury flavor. Trunk is huge, well laid out. Even spare is carpeted. The 18.5 cu. ft. of usable luggage space is 1.4 more than the Cadillac's; 0.5 more than Lincoln's. The torsion-bar suspension gave Imperial the edge in handling among U.S. cars, but the three foreign luxury cars we test-drove cornered better



Fully automatic everything . . .

If it's not standard on the Cadillac, chances are you can get it as an option—no matter what it is. Door panels are carefully inlaid with thick walnut, and picnic tables fold out in Brougham model. Traditional rear fins reached high point seven years ago, gradually were cut down in recent years. Styling changes from last year are subtle, but overall effect is noticeable. Front end especially looks more tasteful and rich, less chrome-y



greater ground clearance on bad roads.

The Jaguar Mk X boasts two 12-gallon fuel tanks, each with its own electric fuel pump. This setup came in handy in our test car. It had been in an accident before we got it, and we soon discovered a leak in the fuel pump. No problem. We simply switched to the other tank.

An exclusive feature is the triple-safe brakes in the Rolls—two independent hydraulic systems plus mechanical linkage to the rear wheels. Normally, all work together, but they can work independently in the event of a failure.

We started our tests with an Imperial equipped with airconditioning, automatic speed control, six-way power seats, power windows and vents, and central door-lock control.

On the freeway, we set the speed control and sat back. First thing we noticed was

that conversation was as easy as talking to your favorite bartender. Wind noise is barely noticed.

The big V8 held 75 with no strain, up hill and down, with no noticeable power surges. The airconditioning, adjusted for the just-right temperature, kept us comfortably cool that hot afternoon, without the sound of rushing air.

Cadillac lent us a meticulously prepared Series 60 Special Brougham with Automatic Climate Control, power windows and vents, six-way power seat, front-seat armrest, tinted glass, padded roof, automatic headlight control, high-low-beam control, AM/FM radio, automatic speed control plus all the regular goodies.

When we started the engine in the dark garage, headlights and airconditioning automatically went on. With the shift into Drive, the parking brake automatically



released. The variable-ratio steering was noticeable as soon as we pulled out, but the difference was subtle. The car seemed to glide. Even the brakes seemed smoother.

Outside the garage, the headlights shut themselves off. The cabin stayed at the preset 70° F.

Corners could be negotiated with just half a turn of the steering wheel. And that big 429-cu.-in. V8 moved the Sixty Special's 4700-plus pounds easily and quietly. Actually, you don't notice the quietness until you roll down a window and street noises come in.

Parking this 21-footer is easy—if you can find the room. Variable-ratio steering eliminates frantic cranking.

Our Lincoln test car had a long list of servomechanisms, including automatic temperature control, speed control and electric locks. Its 462-inch V8 is the big-

gest in the industry, and its 340 hp moves its 5285-pound load easily.

The new transmission is one of the smoothest. And the front disc brakes give a clear edge in stopping power.

Big cars tend to ride better than do small cars, and at speed Lincoln's ride is hard to match. But at low speed, both Lincoln and Imperial felt harsh. Other gripes in the Lincoln: windshield wiper chatter, high engine and exhaust noise, and wind leakage around the vent window, all especially irritating in a car of this price.

The Imperial's interior was the cheeriest of the three. Its color schemes were bright. The Crown Imperial steering wheel, dash and door trim are inlaid with claro walnut, a wood so expensive it isn't even used in fine furniture.

Lincoln uses synthetic wood grain, while

Cadillac has rich 3/8-inch-thick walnut paneling on Fleetwood doors.

All the cars carry a wider range of upholstery fabrics and colors, and choice of exterior paints is about 40 percent greater than on regular cars. Cadillac sometimes uses more material in testing a fabric than goes into cars during a year's production.

Imperial carpeting is a deep-pile, cut carpeting. It looks and wears better. Another example of costly design is the Imperial front arm rests. They contain power-window switches, the door handle, central lock switch for all doors, an overriding switch that cuts out individual window controls on the other three doors, and a

compartment roomy enough for a purse.

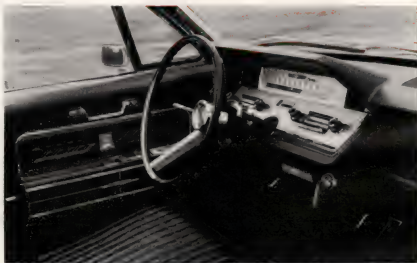
The most exotic technique for testing upholstery is Cadillac's "mink test," which ensures that clothes won't be damaged by too abrasive a fabric. Three mink coats are worn by female employees during 50-mile trips. Any hairs that rub off on the seat are picked up on a small tape-covered card. The new material passes or fails depending on how many hairs are picked up.

Of the three American cars, Lincoln has the most stringent testing procedure. Every car is road-tested 12 miles. Before a car is sold, it has had an oil change, a new oil filter and a new oil pan.

Heavyweight champs. Luxury cars have always been big and heavy, and this

Over 2½ easy-riding tons . . .

need a big engine to push them along. Lincoln's 462-incher is the biggest. The dash is modern, not as sumptuous as those of the other cars. High-speed ride was excellent. Lincoln makes the only four-door convertible available today; rear doors hinge in back for maximum ease of exit and entry. One drawback in convertible, however, is that with top lowered, trunk space is practically nonexistent. Vented disc brakes in front stopped quickly and with little fade, but foreign cars' brakes still felt more sensitive and progressive. Steering was slow



Posh racing tradition . . .

reflects in Jaguar Mark 10 engine, whose one hp per cubic inch gives sporty performance. The "Jag" is really in a category apart from the other cars, since its primary purpose is performance. It's a driver's car more than the others are, and its handling is the best of the lot, though Mercedes and Rolls are a close second and third. The Jaguar tends to be the most temperamental probably because its engine is so highly tuned. High oil consumption is a long-time Jaguar characteristic, and the Mark 10 is no exception. But for the money, it's a bargain for the driver who wants to go fast luxuriously



isn't accidental. An extra measure of strength is built in for trouble-free service. Each car has more wiring than does a five-room house. A Lincoln front door weighs 129 pounds. An Imperial convertible has 17 motors in addition to the engine. Bigger engines allow reduced-ratio rear differentials, which in turn give lower engine speeds, quietness, economy and less wear.

But all isn't perfection. Cadillac, for example, is having trouble with window seals and weatherstripping. The culprits are a new sealing technique and pillar design.

Lincoln's four-door convertible, the only one made today, has one incredible flaw. With top down, even a two-suitcase

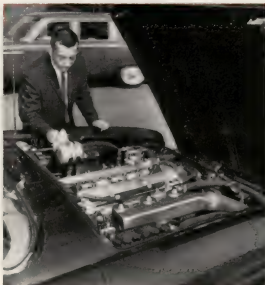
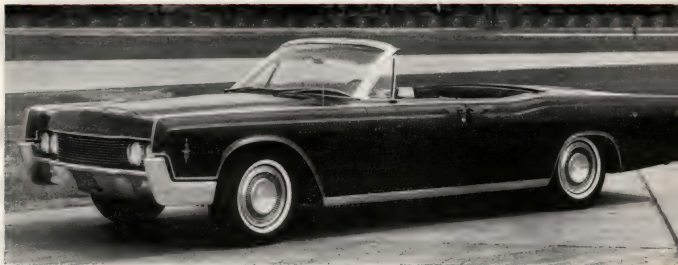
won't fit in the trunk. Trunk space in the sedan, on the other hand, is cavernous.

Imperial's big drawback is its stodgy, old-fashioned styling. But for sheer size, you can't beat the car.

A \$300 grille. Our foreign-car tests started with a Rolls-Royce Silver Cloud III. The Silver Phantom runs \$32,000, or even more with custom coachwork, but our test car was the poor man's model. Only \$17,675 including airconditioning. It's identical to the short-wheelbase Bentley, except for the handmade, hand-soldered, stainless-steel grille (an extra \$300).

Rolls factory testing is the most thorough of all. Every car is run at least 130

(Please turn to page 230)



THREE HOT ENGINES HIT THE STREET

They're not for maiden aunts or people with bad nerves, and they require skillful driving; but if you love performance, check out the Ford, Chrysler and Chev 425-hp tamed-down racing V8s.

By Jim Dunne

DETROIT'S THREE MIGHTIEST ENGINES, the 425-horsepower monsters from Ford, Chrysler and Chevrolet may create a whole new breed of careful drivers. They'd better! Otherwise you may see people come out of their driveways doing rear wheel stands.

All that power demands a degree of alertness and caution that has never before

Chevrolet



WITH ALL THAT POWER, Chevrolet proved to be a handful on gravel roads. It was the only test car with conventional soft suspension. New 427 engine, only one of the three with a single four-barrel carburetor, felt more docile than the others, though its performance was competitive. Mild carburetion, combined with ultra-efficient porcupine-valve head design, gave by far the best fuel economy. Valves jut out in all directions like a porcupine's quills; their main advantage is to provide a smooth, unrestricted flow of fuel through the ports, without the usual sharp bends

been required of the driver of an average automobile. There is too much Go in these engines for anyone to be careless behind the wheel.

But the big powerplants add fun to your driving too. Besides providing power to get out of dangerous traffic quickly, the engines furnish more control over the action of the car; something seldom experienced nowadays in Detroit's automated sedans.

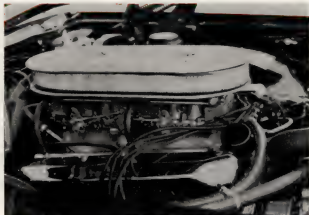
Now, for the first time, domesticated versions of all the companies' seven litre race engines are available for drivers who need everyday transportation, but still want to use the dragstrip for amateur competition. All have identical 425 h.p. ratings. Ford offers the 427 cubic inch V8 in Galaxie models; Chevrolet's "porcupine" 427 comes in Impalas and Corvettes; Chrysler's hemi 426 is available in Coronets, Belvederes and Chargers.

We took three cars equipped with these engines and put them through controlled tests to see just what such power feels like on the road. Ford supplied a 7 Litre 2-door hardtop, Chevrolet an Impala SS convertible and Dodge a Coronet 2-door hardtop for sampling. They were run through acceleration, handling and gas economy tests. All three cars were built with standard factory parts and tires. The engines were the same ones you can get from your dealer. There was nothing special done to the cars that was not spelled out in the specs. They were strictly stock, beefed up with the safety and handling equipment that is normally recommended by the factory for street driving.

Our test showed the cars to be pretty evenly matched in performance. Because

Ford

HYDRAULIC VALVE lifters limit the revs on Ford 7 Litre engine, but they're quieter than mechanical lifters. Street options such as automatic transmission, power steering, power brakes and airconditioning, not available with racing 427 engine, can be had with 7 Litre. However, heavy-duty suspension, standard with racing engine, is optional in this car. Front power disc brakes are standard on 7 Litre, optional in other Galaxies. Exterior identification is provided by striping, special wheel covers, 7 Litre emblem



of the different equipment, each did best in different phases of the performance testing. With the same tires and rear-end ratios, it took the skill of the driver to tip the scales in favor of one car or the other.

Acceleration runs showed Chevrolet to be fastest in the sprints: zero to 30, 0-60 and 0-90 miles per hour. The Coronet hemi was fastest in speeds in the passing ranges from 40-60 and 60-80 miles per hour. And somehow Ford managed to win the quarter mile run with an elapsed time of 14.5 seconds, even though it was second or third in every other acceleration run.

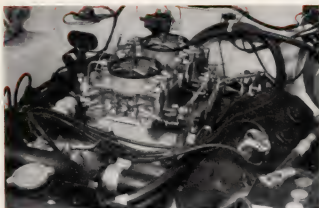
Fuel consumption is a different story. Here, Chevrolet came out the undisputed champ with 17.65 mpg. The Dodge went 13.8; Ford lagged far behind at 11.4.

I ran the Ford test first, in a 7 Litre 2-door hardtop. The car was loaded with options: transistorized ignition, disc brakes in front, AM FM radio, power bucket seat, center console, power door locks and a new safety convenience panel that lights up like a Chicago jukebox.

Ford Division had the car outfitted with heavy-duty suspension, oversize wheels and 8.15 x 15 Firestone 500 tires. There also was a heavy-duty clutch and a 4.11 rear axle for maximum torque off the line. All told, the Ford weighed 4506 pounds during acceleration runs. As mentioned, this car had the best quarter-mile time. It was a tenth of a second behind Chevy on the 0-30 run, but

(Please turn to page 226)

Chrysler



STREET HEMI 426, available only in Dodge Coronet and Charger and Plymouth Belvedere, is basically the racing hemi but with milder cam, lower compression. Test Coronet was at slight disadvantage because it was only car with automatic instead of four-speed manual transmission. But TorqueFlite proved efficient and positive. Optional heavy-duty suspension gave almost harsh ride, but handling was fine. Traction off line was no problem, thanks to good gearing, limited-slip differential. No axle hop, either.





To beat Jack Frost. Canadian engineers are experimenting to determine if a layer of two-inch-thick polystyrene boards between the asphalt surface and the base course of a road will prevent heaving in extremely cold weather. Test site is a 100-foot section of road in Ontario. Thermocouples were buried in the roadbed to provide constant temperature readings.

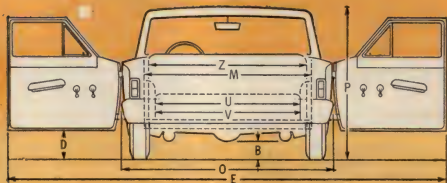


Nine-and-a-half-foot tire towers over small fry. It's one of four used on Army's new amphibious "Bard," a 100-ton vehicle that will haul 120,000 pounds of cargo or 100 soldiers over land or water. Each tire weighs nearly 1½ tons and includes enough rubber for 600 passenger car tires.



Cooling-system tester. When your engine is overheating you can quickly trace the trouble to a sticking thermostat, balky water pump or clogged water passage by connecting the flow pipe of the new Morgan Tester between the radiator and its inlet hose. Action and level of the water after it passes through a butterfly valve and tiny hole into a clear plastic standpipe tell the story with readings on a simple flow meter. The tester also reveals if the system needs flushing or has a combustion leak into the water jacket. It is sold, complete with adapters for 1¼ to 2-inch hoses, for \$24.95 by the Morgan Manufacturing Co., 29 S. Brown Ave., Scottsdale, Ariz.

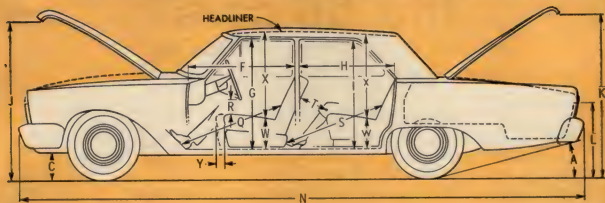
Comfort-Livability



	A	B	C	D	E	F-G	H-I	J	K	L	M			
	Max. driveway departure angle*	Max. depth doorslit to floor	Min. road clearance	Min. front-end curb clearance	Open-door curb clearance	Open-door wingspread	Front-door opening horizontal x vertical	Rear-door opening horizontal x vertical	Head clearance under hood	Head clearance under trunk lid	Luggage lifting height	Trunk-opening width	Usable luggage capacity, cu. ft.	Standard Steering ratio (1:1)
Ambassador	13.7	4.3	5.6	8.0	15.0	142.4	35.0x36.5	33.0x36.0	71.5	63.3	21.1	49.8	15.2	28.4
American	16.7	3.5	6.0	8.0	14.3	137.1	34.8x37.0	33.0x36.0	66.0	63.8	26.6	45.5	12.0	29.0
Belvedere	9.9	4.0	4.4	8.0	14.5	145.6	30.5x36.5	30.0x36.0	67.5	61.0	22.4	48.3	16.8	29.0
Barracuda (2-Dr.)	11.8	2.5	5.0	7.5	14.3	150.5	41.0x36.5	—	6.75	56.0	23.4	48.8	5.7	28.9
Buick	15.5	0.3	5.5	7.1	12.3	148.5	37.0x38.5	33.0x38.5	73.8	71.3	27.9	57.5	17.0	33.2
Cadillac	13.7	1.5	7.2	9.0	13.3	148.9	34.0x36.5	31.0x36.5	76.0	71.0	27.2	57.5	17.1	NA
Chevelle	13.0	2.0	4.8	9.0	12.8	134.7	43.0x36.5	29.3x36.5	71.0	71.0	28.9	52.3	17.1	28.0
Chevrolet	12.0	2.5	5.7	7.5	12.5	163.8	33.5x37.0	30.0x37.5	71.5	71.0	24.8	54.0	18.3	28.2
Chevy II	17.0	2.0	6.1	8.5	13.5	134.0	32.0x37.5	31.0x37.5	67.0	69.3	23.2	53.5	13.0	25.4
Chrysler	10.1	2.5	5.4	8.0	15.0	152.6	35.0x36.5	32.0x36.5	72.5	72.5	25.6	54.5	17.4	32.1
Classic	13.7	4.0	5.9	7.5	14.0	142.4	34.8x36.5	33.0x35.8	67.0	63.3	21.1	49.8	15.2	28.4
Comet	14.1	2.5	5.5	10.0	14.0	138.9	31.8x36.8	30.0x35.5	73.0	67.3	29.1	51.8	15.0	25.4
Coronet	11.6	3.5	4.5	7.5	14.0	145.6	33.0x36.5	29.5x36.0	70.0	66.5	NA	46.0	22.5	29.0
Corvair	20.0	4.0	5.4	10.5	12.0	131.3	30.8x35.0	28.0x34.5	65.0	72.0	27.6	48.0	7.0	23.3
Corvette (2-Dr.)	17.0	6.5	5.0	8.0	14.0	139.3	33.5x32.5	—	68.0	—	—	—	10.6	20.2 ¹
Dart	12.5	2.8	4.9	8.0	14.5	139.2	33.0x36.0	28.3x35.5	72.5	64.5	20.4	46.0	17.3	28.9
Dodge	10.8	2.5	5.4	7.0	13.0	152.6	37.0x38.0	33.4x37.0	72.3	64.0	22.7	48.5	NA	32.0
F-85	16.0	1.0	5.5	7.0	13.0	135.0	31.0x37.5	28.3x37.0	73.0	68.0	30.1	53.3	20.1	28.3
Fairlane	13.1	3.0	5.4	9.5	14.3	158.2	31.5x36.3	29.0x35.5	73.0	65.5	22.4	51.8	15.2	29.4
Falcon	15.9	4.0	5.8	7.5	13.8	158.2	31.5x36.8	29.0x35.8	71.0	58.3	23.1	49.5	12.3	29.4
Ford	11.9	2.0	5.5	9.0	14.0	164.1	31.8x37.0	29.0x36.0	72.0	63.3	23.4	49.5	19.1	30.9
Imperial	9.2	1.5	4.3	8.0	15.0	154.0	35.0x38.5	26.0x37.5	73.0	68.0	27.8	60.0	18.5	19.4 ¹
Lincoln	12.2	3.3	5.5	9.8	13.3	148.9	33.5x37.5	30.0x36.0	81.0	68.8	26.2	68.0	18.0	20.5 ³
Marlin	14.0	3.8	6.2	9.0	13.5	155.5	44.3x35.3	—	67.0	55.5	24.7	25.8	11.7	28.4
Mercury	13.3	1.5	5.9	9.8	13.0	145.6	32.0x37.0	30.0x37.0	74.0	68.0	24.4	56.5	18.6	31.1
Mustang (2-Dr.)	17.1	4.0	5.2	8.8	14.5	150.2	42.0x33.0	—	75.0	57.0	27.5	50.3	6.0	27.0
Oldsmobile	13.1	0	5.6	8.8	13.8	143.8	33.0x39.0	33.0x38.5	74.0	74.0	27.9	57.3	19.4	33.4
Plymouth	10.4	3.5	5.2	7.5	14.25	152.6	35.0x37.5	30.0x37.0	74.0	62.5	18.1	54.3	17.0	32.0
Pontiac	13.2	1.3	6.0	8.2	12.8	143.6	33.3x37.8	30.0x38.3	74.3	66.3	29.0	53.5	19.2	29.8
Riviera (2-Dr.)	16.8	0	4.8	7.8	13.0	163.2	43.0x38.0	—	78.0	69.0	26.9	45.8	10.3	19.4 ¹
Special	17.5	1.5	6.0	8.0	12.5	134.1	31.0x37.0	29.5x36.5	71.0	67.0	28.4	56.0	18.9	28.6
Tempest	14.8	2.0	5.7	6.5	12.5	134.5	32.0x38.0	29.5x36.0	73.0	69.5	29.1	51.5	21.6	28.3
Toronado (2-Dr.)	13.0	0	5.0	8.5	12.0	170.2	31.0x38.8	—	74.0	64.0	31.6	50.5	14.5	17.8 ¹
Thunderbird (2-Dr.)	12.9	4.0	5.5	8.0	12.8	NA	45.0x37.0	—	69.0	57.0	27.1	65.3	11.5	20.4 ¹
Valiant	11.6	2.5	5.0	7.5	12.5	139.2	34.0x36.5	28.5x36.0	71.0	60.0	23.2	50.0	14.1	28.9

¹17.6 optional ²2.0 optional ³power steering standard

Index to the 1966 Cars



N-O-P

Q R S T U V W X Y Z

Overall length x width x height	Turning circle curb-to-curb, ft.	Wheel turns lock-to-lock	Wheelbase	Max. front legroom	Min. steering wheel curb-to-curb clearance	Min. rear legroom	Min. rear knee room	Front-seat hiproom	Rear-seat hiproom	Seat height front/rear	Headroom front/rear	Front-seat travel	Min. shoulder room	Glove box depth x opening width x opening height
200.0x74.5x55.0	39.0	6.0	116.0	41.0	4.3	41.0	5.0	60.2	60.1	11.8/13.1	39.2/37.0	6.0	57.8	5.8x15.0x5.5
181.0x69.5x54.5	38.0	6.0	106.0	41.0	4.1	36.5	3.8	57.2	57.1	11.8/12.6	39.2/37.0	6.0	54.8	5.0x17.3x6.0
200.5x75.5x54.9	40.6	5.4	116.0	42.0	4.3	34.2	4.4	60.4	60.6	8.6/11.0	38.7/37.2	4.5	58.0	5.5x19.0x6.0
188.3x70.2x53.0	37.1	5.3	106.0	40.7	2.9	30.6	1.1	56.9	57.0	8.0/10.3	38.7/36.8	4.5	52.6	6.0x10.3x4.5
217.0x80.0x55.2	43.2	5.8	123.0	42.2	4.2	39.0	5.6	63.7	62.9	10.7/14.2	38.9/37.7	4.8	61.4	7.0x14.5x5.5
224.0x80.0x55.6	44.7	NA	129.5	41.0	3.5	41.6	8.1	61.9	62.5	12.5/14.7	39.5/38.4	4.8	60.8	10.0x11.3x5.5
197.0x75.0x53.0	40.3	5.5	115.0	41.9	3.9	38.0	3.5	59.9	59.9	10.9/13.2	38.5/37.3	4.0	58.7	6.0x12.5x4.0
213.2x79.6x55.4	40.8	5.4	119.0	42.2	4.0	39.5	5.7	63.7	62.9	11.4/14.2	38.1/37.3	4.8	61.3	8.0x15.5x5.3
183.0x71.3x55.1	38.4	4.5	110.0	40.7	3.5	36.2	3.3	58.2	58.6	12.0/12.5	38.8/37.3	4.0	55.2	5.0x17.5x5.0
219.0x79.5x55.5	44.0	5.8	124.0	42.0	4.4	40.8	7.4	63.3	63.4	8.9/11.8	39.3/38.5	4.5	60.0	8.0x13.0x6.0
195.0x74.5x54.3	39.0	6.0	112.0	41.0	4.3	41.0	5.0	60.2	60.1	11.8/13.1	39.2/37.0	6.0	57.8	6.0x15.0x5.3
195.9x73.8x55.0	41.5	5.0	116.0	42.1	4.3	33.9	4.2	59.5	58.3	10.7/13.7	38.8/37.3	5.0	56.7	8.0x12.5x4.8
203.0x75.3x53.7	40.9	5.4	117.0	42.0	4.3	36.5	4.4	60.4	60.4	8.6/11.0	38.8/37.8	4.5	58.0	6.0x19.3x6.0
183.3x69.7x51.2	35.2	4.7	108.0	41.1	3.1	35.4	3.0	56.1	56.1	10.0/11.6	37.6/36.4	4.0	54.3	6.5x11.0x6.0
175.1x69.2x49.6	39.9	3.4 ²	98.0	42.7	4.5	—	—	50.9	—	9.0/—	37.0/—	4.0	48.4	6.5x16x17.5
186.3x70.8x52.7	38.6	5.3	111.0	40.7	3.0	35.6	4.5	56.9	57.0	8.0/11.6	38.2/37.3	4.5	54.2	6.0x8.5x4.5
213.3x80.0x55.4	43.4	5.8	121.0	42.0	4.4	40.8	7.4	63.3	63.4	8.9/12.0	39.3/38.5	4.5	60.0	6.0x11.2x5.5
204.2x75.4x54.5	41.0	5.6	115.0	41.3	3.4	36.0	3.6	59.9	59.9	11.1/13.3	38.1/37.2	4.0	58.8	9.0x9.3x5.5
197.0x74.7x55.0	41.5	5.0	116.0	42.1	4.3	36.1	4.2	59.5	59.5	10.7/NA	38.5/37.5	5.0	58.0	6.5x14.0x5.0
184.3x73.5x54.6	39.8	5.0	111.0	42.1	4.3	36.0	2.2	59.5	59.5	10.7/NA	38.4/37.7	5.0	58.0	6.4x14.0x5.3
210.0x79.0x55.6	41.0	5.8	119.0	41.8	4.2	37.7	4.7	62.6	62.7	10.3/NA	38.8/37.7	5.5	59.9	5.5x13.0x4.0
227.8x80.0x56.6	47.7	3.2 ²	129.0	41.5	3.8	40.4	8.8	61.0	60.2	8.4/11.3	38.4/38.7	5.0	62.0	7.0x15.0x4.8
220.9x79.7x54.5	47.4	3.8 ¹	126.0	41.0	4.0	40.5	7.8	62.0	62.0	12.4/13.3	39.4/38.6	5.5	59.8	5.3x15.8x3.1
195.0x74.5x54.2	39.0	6.0	112.0	41.0	4.3	36.0	3.9	60.2	58.4	11.8/11.0	38.8/36.5	6.0	54.6	6.0x15.5x5.6
220.4x79.6x56.0	43.6	5.3	123.0	41.9	4.2	37.6	4.4	62.6	62.7	10.6/13.2	38.8/37.7	5.5	58.7	7.0x13.0x6.5
181.6x68.2x51.5	38.9	4.6	108.0	41.8	3.2	28.8	0.6	54.7	50.9	9.2/NA	37.4/35.6	5.0	53.9	7.8x13.3x3.0
217.0x80.0x55.5	43.6	5.5	123.0	41.1	3.8	39.0	5.3	63.7	62.8	10.8/14.4	38.8/37.8	4.8	61.4	6.3x15.5x4.3
209.8x78.7x54.9	42.7	5.8	119.0	42.0	4.4	38.7	5.6	63.3	63.5	8.9/11.9	39.0/37.7	4.5	60.0	7.0x17.0x5.0
214.8x79.7x55.3	42.8	5.0	121.0	42.6	4.5	38.3	4.5	63.7	56.4	11.0/14.3	38.4/37.2	4.8	61.3	8.0x15.0x3.8
211.2x78.8x53.4	44.0	4.0 ¹	119.0	41.3	4.0	35.2	3.9	62.2	54.4	10.8/12.2	38.0/37.5	4.8	57.4	9.0x11.3x5.0
204.0x75.0x55.3	40.6	5.6	115.0	41.1	3.4	36.0	3.5	59.9	60.0	10.6/13.3	37.8/38.3	4.0	58.8	5.8x14.3x3.8
206.4x74.4x54.0	40.9	5.0	115.0	41.2	3.6	35.7	3.6	59.9	59.9	11.0/13.0	38.1/37.3	4.0	58.6	6.5x11.8x4.0
211.0x78.5x52.8	43.0	3.4 ¹	119.0	41.5	4.1	35.5	4.1	62.2	55.6	10.9/12.3	37.9/37.5	4.8	57.8	6.0x12.3x4.0
205.4x77.3x52.5	42.6	3.6 ¹	113.0	39.7	3.2	33.2	2.7	59.7	49.9	10.7/NA	37.4/37.6	4.0	54.0	5.0x9.3x6.0
188.3x70.2x53.0	37.1	5.3	106.0	40.7	3.0	34.2	3.1	56.9	56.4	8.0/11.6	38.6/37.3	4.5	54.2	6.3x8.5x4.5

NA Not available.

Your serviceman looks at the '66 cars

Dual points on that Chrysler hemi need adjusting?
Toronado shocks need desqueaking? Here's how

By Todd Douglas

IT'S THE YEAR of the big engines. Detroit is adding cubes and making the innards more sophisticated—which means extra horses and, in some cases, new servicing techniques.

Other than that, 1966 is a quiet year, but for a few notable exceptions. There's the Oldsmobile Toronado with front-wheel drive and a brand-new, unusual chassis; a new four-barrel carburetor for several GM cars; a couple more cars with optional disc brakes, and lots of minor refinements.

Why polish and improve these seemingly unimportant hidden components when last year's models had no major ailments? Engineers don't make deliberate changes just for the sake of change. Between model years, researchers run fatigue tests on various parts to deliberately wreck them and to find any hidden weakness that could eventually lead to failure or even just customer irritation. The result of their work is improved quality.

The engine population is growing. This year more than 85 engines are offered with carburetion ranging from single venturis (Vs) to two 4Vs and even three 2Vs. Some car divisions have 9 engines with different horsepower ratings, others have 11, and Chrysler has 13. Chevrolet alone

has almost 60 carburetors with different part numbers for their nine engines.

Stars of the engine world should include the Chrysler Corp. hemi-head 426-inch V8 for Belvedere and Coronet, the 230-inch overhead-cam Six by Pontiac, the 250-inch overhead-valve, in-line six from Chevrolet (also available in short-wheelbase Olds models) and the "big daddy" of them all, the whopping 462-inch job from Lincoln-Mercury.

Other engines, almost without exception, have increased power and performance stemming from improved distributor advance curves, better intake manifolding, better control of fuel-air mixtures and improved cams.

The exciting performance entry this year is the street version of Chrysler's famous hemi-head. Designated the HP², it has a compression ratio that is reduced from the competition 12.5:1 down to a more modest 10.25:1 and a gentle cam with less valve overlap for improved low-speed running. Add two four-barrel carbs and you wind up with 425 horses at 5000 rpm.

Dual distributor points make dwell setting somewhat different. First adjust one set and then the other, each time with the opposite set insulated by a small piece of



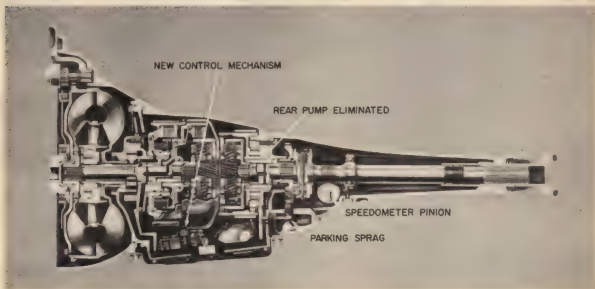
TORONADO . . . rides on all-new suspension with brand new drive posing all new problems



DODGE CORONET . . . with street hemi engine has unusual problems in setting dual points



CAM-TYPE CASTER and camber adjustment points are indicated here. Steering gear is horizontally located



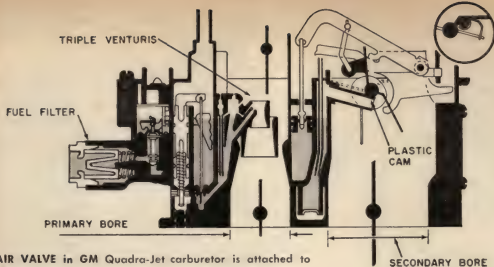
SIMPLICITY is the trend in automatics. Improvements in Chrysler TorqueFlite allow elimination of rear pump



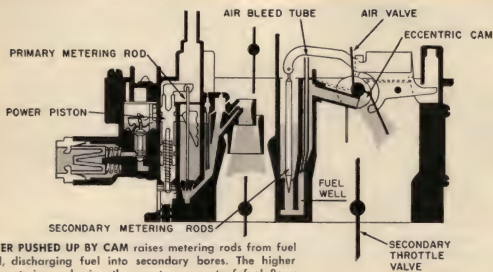
TEMPEST GTO . . . with overhead-cam Six has neoprene timing belt that can be adjusted easily
JAN. 1966



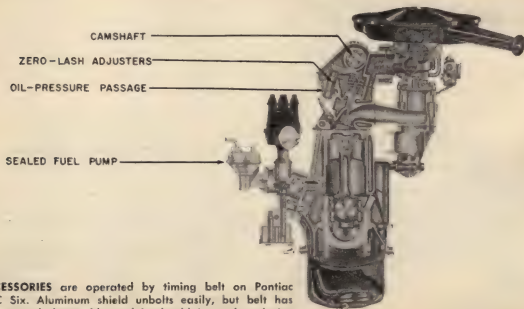
LINCOLN . . . boasts industry's biggest engine, a 462-incher. Few '65 engine parts fit it



AIR VALVE in GM Quadra-Jet carburetor is attached to plastic cam. Air pressure opens valve against spring pressure (circled inset), which in turn rotates cam



LEVER PUSHED UP BY CAM raises metering rods from fuel well, discharging fuel into secondary bores. The higher the metering rods rise, the greater amount of fuel flows



ACCESSORIES are operated by timing belt on Pontiac OHC Six. Aluminum shield unbolts easily, but belt has been tested thoroughly and it shouldn't need replacing

cardboard, for dwell readings of 27 to 32°. Then, with both sets working together in the circuit, dwell should be 37 to 42°.

Besides its new cam arrangement, the Pontiac OHC has many other unusual engineering features. For example, the neoprene timing belt, beefed up with fiberglass cords woven into the material to resist stretch and wear, performs more than one function. Deep teeth on its inner surface permit it to drive the distributor, fuel pump and oil pump through a single sprocket with a common shaft. These units are contained in a removable aluminum casting that is also the mounting for the engine oil filter. Belt adjustment is simple: Loosen the mounting bolts of the die-cast housing and shift the entire assembly within the slotted holes.

Mechanics will appreciate the simplicity of design and the accessibility of parts for service. And there are no valve lifters or push rods to cause heavy power-gobbling inertia forces.

Correct valve lash, or clearance, is maintained by zero-lash hydraulic adjusting mechanisms that are fed oil under pressure through passages in the engine head. These adjusters are unique in that they work directly against individual rocker arms while the cam lobes function on the top side of these cam rockers. As a result, cam lobes have only one job: to force the valve open. With all adjustable screws, lock devices and valve-train push rods eliminated, maintenance is not needed.

The largest-displacement engine is the 462-cu.-in. Lincoln Continental V8, which puts out a modest 340 hp at 4600 rpm with 4V carburetor. Basically, it is a refinement of last year's proven 430-incher. But parts interchangeability between the two engines is limited, since bore and stroke have gone from 4.30 x 3.70 to 4.38 x 3.83 inches. New, lighter pistons, new cylinder heads with larger porting, new intake valves with increased head diameter (now 2.03 inches) and a new camshaft with higher lift lobes are used. Add to this a new crankshaft with longer stroke plus an intake manifold with smaller diameter passages (also called runners) that, amazingly, provide better breathing and you have 10 percent more performance without loss of gas mileage.

Top Chevrolet engineering planners told their staffs to take the old 144-hp in-line Six and boost it at least 10 more horses—

but drop the rpm. And they did it. Their new 155-hp version gets this rating at a low 4200 rpm out of 250 cubic inches. Both the 144 and 155 have the same bore (3 $\frac{3}{8}$ inches), but the larger engine has an almost $\frac{1}{32}$ -inch-longer stroke. Compression height (measured from the centerline of the piston pin to the top of the piston head) is now different than in the 144 power plant, so pistons cannot be interchanged. Oil pans may look alike on the outside, but different baffling prevents switching.

This new Six is as easy to maintain and service as any other Chevrolet Six, since all external operating units, such as the distributor and fuel pump, are about in the same location. Tune-up specs are identical to those of the 144 except for initial timing, which is 6° BTDC.

Some other new engines for 1966 include the 440-cu.-in. power plant for some Dodges, Plymouths and Chryslers, and for all Imperials. There is also the new increased-horsepower 390-inch for Mercury and some Ford models and the 425-incher optional on full-size Oldsmobiles and standard on the Toronado.

Lubing the Toronado. This classy 4500-pound front-drive fastback needs little or no lubrication. Engineers have discarded frequent front- and rear-wheel bearing repacks. They are recommended only at the time of major brake overhaul, and only on the rear wheels, which rotate on dead rear-axle spindles.

Also, no lubrication is necessary for the Rzeppa-type, constant-velocity U joints (two are used at each drive axle), alternating-current generator, starter motor, upper and lower control-arm pivot points (they're rubber bushed), and front and rear attachments for the hardened-steel torsion bars, which take the place of coil springs. Nor should rubber-mounted units such as shock absorbers (four at the rear, two up front) and the rubber bushings in the front suspension pivot points be greased or oiled. They can be "desqueaked" with a soapy-water solution.

Break-in oil, tune-up juice or other friction-reducing compounds are not recommended in the Olds 425 engine. Just keep a good MS engine oil in the crankcase and change the oil and filter every six months or 6000 miles, whichever comes first. That MS label means the oil has passed the carmakers' tests for low-tem-

(Please turn to page 224)



Cab drivers can be safe from robbery and other attacks by back-seat passengers in taxis fitted with a new bulletproof glass partition. A pass-through hatch enables fares to be paid and change given without lowering the window. In case of emergency, a switch panel beside the steering wheel allows the driver of the "Safeguard" cab to automatically lock the rear doors, raise the bulletproof partition, and set off a flashing warning light.



Drawings by computer. A new computer-directed machine enables a draftsman to quickly convert two-dimensional drawings into accurate perspective illustrations. The draftsman uses two styluses on the horizontal table to trace front and side blueprint views of an object. Information flows from the styluses into a computer, which guides the plotter pen that produces the three-dimensional view on a vertical easel. Maker is Perspective, Inc., of Seattle.



Electricity on the range. The West just ain't what it used to be! Cowhands can now do their branding electrically with the Thermark electric branding iron which plugs into any 110-volt outlet and takes only two minutes to heat, and will mark anything that will burn. It has a two-inch half circle and four-inch running bar, and sells for \$7.95 from Everhot, 57 S. 19th Ave., Maywood, Ill.



Low lights cut the overhead on maintenance of the 45,000 lamps illuminating the 930 miles of the Olympia Strasse in Munich, Germany. Resembling giant soup cans, the 125-watt mercury vapor lights utilize mirrors to reflect the light at a low angle across the roadway. They have proved highly effective in fog and in lighting objects on the road.



Shirt-pocket TV. A mere $3\frac{1}{2}$ inches high, $4\frac{1}{2}$ inches long and less than 2 inches wide with a 1-inch diameter picture tube, this Westinghouse TV is a true pocket portable. It works off batteries or can be plugged into a wall outlet. Built with microcircuits, the set dramatically shows how small, small can be. This TV is the only one of its kind and will not be sold commercially.



Pneumatic-tired track supports and propels a new Army amphibious cargo carrier over all terrains, normal hard surfaces, swamps and marshland, tundras and open water. Each inflated cell has cleats for better traction over soft surfaces.

DUESSE

BACK FROM THE

It's a brand-new \$19,500 beauty, equipped with every imaginable

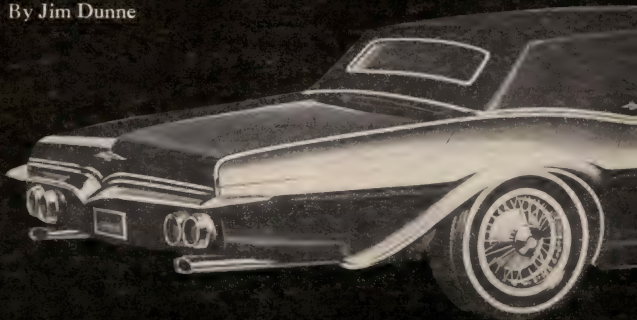


A MONSTER BODY, a powerful engine, rich leather, rare wood and sky-high price — all the tradition of the old Duesenberg will soon be reborn in a new version, designated the Model D.

This new Duesenberg, which will debut in March, is a genuine descendant of the original Model As and Js of 1921-37. The builder is Fred Duesenberg, son of one of the two brothers who started the Duesenberg legend. The car will incorporate the styling of Virgil Exner and coachwork by Ghia Body Works of Italy.

A number of innovations will make it as modern as any car on the road — at a price. It will cost \$19,500, with features such as airconditioning and automatic speed control standard. It will dwarf any existing six-passenger sedan. At nearly 6000 pounds, it will be half a ton heavier than the Lincoln sedan, the present world's heavyweight champ. It also will be almost a foot and a half longer than the Imperial. The hood alone will stretch 82 inches, a full 20 inches longer than any of the standard production Cadillacs.

By Jim Dunne



NBERG

ROMANTIC PAST

luxury feature and destined to be a classic as soon as it is born

Each car will have a practically hand-made steel body from Italy. But all mechanical components, including electric window cranks, airconditioning, windshield-wiper motors, lights, gauges and electric door locks, will be American-made to insure parts availability.

Steel was chosen for the body in spite of the claimed advantages of plastic for low-volume cars. Fred Duesenberg believes plastic, though economical, is not what the owners of this class of car would want. Right now, stamping dies for body panels are being made up in Italy to turn out production parts and build up a supply to be warehoused in the U.S. The dies will be used for five years at least, with a minimum of yearly styling changes.

The body follows modern practices, but retains the glamor of the old models. The classic clamshell fenders are still there, and the massive grille has much of the old look so quickly copied by early Duesenberg competitors. A late change in styling to double-bar bumpers is not shown in the pictures.

Any color available in acrylic lacquer may be ordered, though the company anticipates most buyers will prefer dark, conservative blues, grays and blacks.

In the heavily soundproofed passenger compartment, luxurious leather from



a 200-year-old German tannery is used. The dashboard looks like something out of Project Gemini, with controls for an altimeter, tachometer and two fuel tanks in addition to the regular instruments. Natural mahogany wood paneling—not a veneer or plastic substitute, but honest-to-goodness stuff you can knock on—is used liberally.

Passenger accommodations are spacious, with a conventional bench seat in the rear and modern, individually adjustable split-front seats providing room for six. Head and legroom promises to be inches longer than in any sedan now on the road.

There is one obvious drawback to having body styling that is as balanced as that of the new Duesenberg. Big as the car is, its massiveness does not show up readily—especially in pictures—because the lines are so well proportioned. Oversize tires add to the illusion. Viewed alone, the car could be either large or small, its styling is that well done.

But it's not just the measurement of a fender or the length of the hood. Everything is big on this car. As a comparison, the Cadillac 75 limousine is as long as the Duese, but its styling balance is upset by the stretched-out passenger compartment. The same fenders that look so massive on the Cadillac coupes look a bit dinky on the 75. Not so on the Duese. Its lines are proportioned exclusively for this car.

Chassis design is the tried-and-true separate-frame construction. The frame will be built in Italy and hand-matched to the body there. The whole package then will be flown to Indianapolis for mating with the running gear. Torsion bars are the only springs that Duesenberg engineers figure can carry the extreme weight of the front end and still retain enough life to deliver a soft ride. Conventional multileaf springs will be used in the rear.

Chrysler Corporation's 440-cu.-in. engine and TorqueFlite transmission will provide power. The stock engine is rated at 350 hp, but Duesenberg will add 25 hp with carburetor and ignition adjustments. Contactless electronic ignition will be standard.

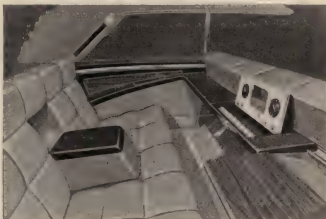
Disc brakes on all four wheels are a near necessity for stopping all that weight. The company wanted to use 16-inch wheels right from the start, but found that modern car design had obsoleted these. Fifteen-inch wheels will be on the car when it is

first introduced, but 16-inchers with 8.90 tires will be used later, when they become available.

An unusual feature is two 16-gallon fuel tanks, one in each rear fender. They're made of the same porous rubber material now required in race cars in the Indianapolis 500. Advantages include more trunk room and extra safety; in a collision, the rubber cells are rupture-resistant, thus lessening the danger of fire.

The warranty is unique: three years without regard to mileage, and it covers all parts and labor.

As far back as last summer, the company had 25 firm orders, accompanied by deposits of up to \$5000—a strong ante in any game, and a good indication of the kind of money needed to own a car of this type. Phil Wrigley, the Chicago baseball and chewing-gum magnate, placed the first order, and will get car number one. Wrig-



LUXURY OF BISCUITED LEATHER, mahogany paneling, personal vanity with clock and radio make this rear compartment like no other one on the road



GLEAMING CHROME, liberally applied, and externally flexible exhaust pipes were a hallmark of early Duesenberg engines. Supercharger was optional item

ley's interest in Duesenberg goes way back. At one time his family owned five of them.

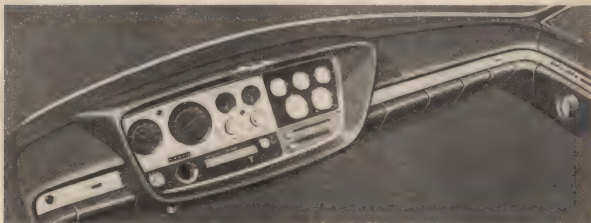
The company will build only one model at first, a six-passenger sedan. Later a convertible and limousine will be added. Limousine production was planned from the beginning, but the decision to build a convertible was forced on the company by the strong demand from West Coast buyers.

Duesenberg plans to build 50 cars the first year, 200 the next and 500 a year soon after. He also hopes eventually to have 50 dealers across the country, mostly "duals" who are engaged in selling other makes as well.

The last of the Duesenbergs, built in 1937, was the Model J, remembered as the Duesenberg among classic-car buffs. Ahead of its time in design and engineering, the Model J had a double-overhead-

cam straight-eight engine. Horsepower was 265, or 320 supercharged, and displacement was a modern 420. The sedan had a wheelbase of 142.5 inches—stretched to a bridge-length 153.5 inches in the limousine.

From 1921 to 1928 Duesenberg built a Model A, a fairly big car that sold for \$7200. It was the first car with hydraulic brakes on all four wheels. Although 900 Model A's were built compared with 480 Model J's, the first car never did have as strong an effect on its owners as the J. There are still 300 Model J's in existence today, according to an estimate of the Duesenberg Club, and they bring high prices in the restorers' market. A collector recently paid \$15,000 for the first Model J to come off the line in 1928. And that's remarkably little depreciation when you consider the original price was approximately the same. ★★



DASHBOARD LOOKS LIKE A CHRISTMAS TREE, bristling with blinking lights, toggles and gauges. Besides normal instrumentation, there's an altimeter, two fuel gauges, ashtray and brake lights, speed control and stop watch

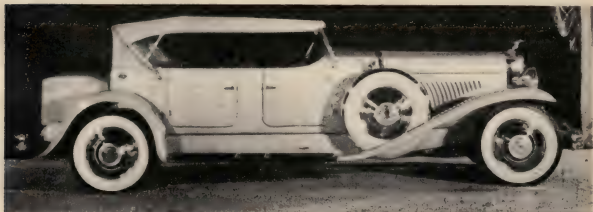


Photo courtesy of Detroit Public Library

TRADITIONAL CLAMSHELL FENDERS and double-bar bumpers show up on this 1931 model. Top is easily lowered for open-air driving. Special tires had white sidewalls on both sides. Grille was widely copied by competitors

Electronic Clinics for Sick Cars

Amid spinning dials and clacking electronic switches, auto diagnosticians will pinpoint your car's ailments; but where you have them cured is entirely up to you.

By Pack Bryan

A SINGLE TECHNICIAN drives car down the line in Mobil Repair Center while assistant adjusts console and checks instrument readings.



THE MAN IN THE WHITE COAT turned off the machine and removed a maze of wires. Then he motioned me into a small consultation room and we sat down, facing each other across a desk.

"Basically, you're in good shape," he began, "but I do have a few suggestions."

I wasn't a patient in a modern medical clinic, about to learn that I'd been smoking too much. Just a crestfallen Saturday Mechanic, learning that all the equipment in one of the new electronic diagnostic clinics had caught me goofing up a plug and point change on the family bus. I really goofed. After the mechanics at the center corrected my mistakes, I found that they had added almost 10 percent to the horsepower available at the wheels, and had tacked on a bonus of an extra mile per gallon. And I thought the car had been running well.

My job was checking out those new "auto clinics" for *Popular Mechanics*. They've been springing up all across the country. By the end of 1965, about three dozen were operating, so it was easy to pick several between Chicago and Milwaukee.

Like many auto buffs, I had often wished that I could run my car onto a dynamometer—one of those large treadmills with instrumented rollers that work against the rear wheels to measure a car's exact horsepower. But dynos are expensive. To find one, you either had to know

someone in Detroit's top engineering circles, or be prepared to fork over next month's car payment to have the car tested on one of the few that existed in the back garages of the racing-circuit boys.

Using every electronic aid you can get—from sophisticated electronic strobe timing lights to accurate dwell meters and specially modified oscilloscopes—you can tune a car up to running condition as it's never been tuned before. But all the electronic tuning gadgetry is calibrated by dynamometer tests. Until you run a car under load on a dyno, you will never be sure what it's putting out. The dyno lets you "blast down the highway at top speed," while the car is sitting still. Instruments measure and record everything.

If these dynamometers are so great, how come they haven't been on the scene long before? Up to now no one was willing to gamble that a fully equipped analysis setup could be sold to the public. Most major oil companies, and many successful dealers and service organizations, are now betting that the time has come. The 36 centers that now exist probably are the forerunners of hundreds that will soon open in metropolitan centers.

The word "metropolitan" is a key to the success of the idea. You can't drop \$100,000 on an installation for once-in-a-while use. Many centers run a 16-hour day.

Folks pay with a smile. A trip through



ASSEMBLY-LINE OPERATION is key to service centers' success. Tests are similar from one center to another



TUNEUP IS double-checked on a dynamometer. Rear wheels of the car transmit power to rollers, which feed the road-horsepower data to the test gauges

one of these centers costs between \$5.95 and \$9.95. Operators count on their diagnostic lanes to refer plenty of business to their adjacent repair and service operations. And so far, they've been right. Most centers report average service tickets of around \$70—almost double the usual amount. And the customers are happy. They get a written guarantee on the work.

To get an idea of how the various lanes work, I ran a '64 Chevelle through four of the clinics. The car is equipped with the small 195-hp, 283-cu.-in. V8, automatic transmission and power steering.

You start with a phone call for an appointment. Don't be late. They work on a tight schedule. When you arrive, a receptionist in a pleasant waiting room takes your name and the basic information about your car, including any unusual problems. If the car has been pulling to the left on braking, for example, they'll pull the left front wheel instead of the usual right, and will utilize whatever special extra equipment is necessary to trace down the fault.

A single diagnostician stays with your car on its trip through the lane. The sequence of steps varies among centers, headlight focus and brightness checks being first on the list at some places and last on others. In between, anywhere from

75 to more than 100 different tests are made. Some are obvious, like checking windshield squirters, wiper speeds, turn signals, horns, parking brakes, shocks, engine-oil level, air filter condition and temperature protection of your antifreeze. Fan belts, battery cables, mufflers, tail pipes, springs, heater hoses and thermostats, power steering, fuel tank and lines, tire tread depth and condition, brake system backing plates and the running gear get thorough visual tests.

Some tests are exotic. Checking the condition of your automatic transmission fluid is important. The diagnosticians let three drops fall off the dipstick into a vial of special fluid that measures acidity. If transmission oil needs changing, the fluid turns color. Later, as the car moves onto the dyno, they check the shift points under various loads at road speeds and compare them with factory specs. As each car goes through the lane, it is accompanied by a clip board containing the "clinical report" plus a master chart listing all factory specs.

Another fluid check, used by a Chicago dealer, uses a special valved bottle attached in place of the radiator cap. The bottle contains a liquid that indicates by a color change any head-gasket leaks into the cooling system.

In the dynamometer section, the car's front wheels are placed on the rollers, which are belt-driven by electric power.



RETAINER keeps wheels from hopping on dynamometer rollers, which would give an inaccurate reading, and prevents the car from running off the machine

These rollers measure braking efficiency and determine whether both front wheels are providing the same stopping power. Generally, a gradual stop is made, and then two crash stops to burn off glaze and detect line restrictions. The tests are repeated with the rear wheels.

Then a wire harness is connected between the ignition system and the dynamometer receiving power from the wheels, the gauges quickly show up bad plugs, point bounce and errors in distributor advance and dwell settings. An oscilloscope gives visual comparison among the sparkplugs to check the condition of each and of the wire that feeds it. The output of the generator and voltage regulator are checked here, as is the cranking voltage. An exhaust analyzer determines combustion efficiency. The actual road horsepower (the part that gets to the wheels after accessories and drivetrain friction take their toll) is then measured at a specific rpm.

I was still disappointed to learn that my almost-200-hp engine delivers less than half that power to the rear wheels. However, the analysis people admit they take readings at a low rpm and that many big engines with wild cams will barely budge the needle until rpm climbs past 4000.

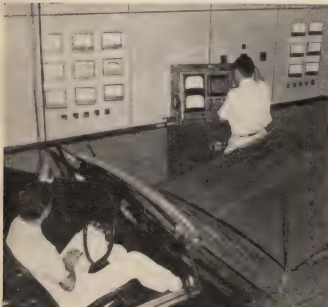
Last on most of the lanes I visited is a front-end dynamic alignment tester, de-

veloped by the Merrill Engineering Labs. Using powered rollers again, this machine checks camber, caster and toe-in with the wheels spinning at 40 mph. I had been told that shop techniques and equipment hadn't yet caught up with the accuracy of the machine. This was proved after one of the best shops in the area did an expensive alignment job on my car before I visited the clinics. The first machine I went through showed up a bad caster setting, and every subsequent machine duplicated the findings.

After the tests, the diagnostician meets you at the door, introduces himself and leads you into a small office. There he goes over the diagnostic report with you step by step. Most centers allow plenty of time for your questions. I was unable to stump them.

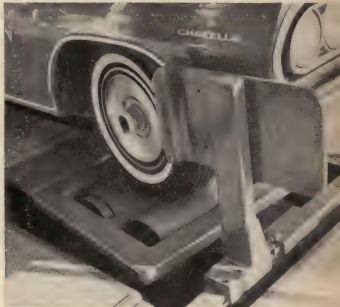
The low-pressure sell. If your car needs work, the diagnostician makes out an estimate form covering parts and labor. Surprisingly, he'll then tell you that the work needn't be done at his center. You're free to take your diagnostic report to your own mechanic for his estimate or actual work. If you get the work done at the center, they'll stick within the limits of the estimate to the penny and will also give you a guarantee on the job. But don't ask to take the cost estimate with you. Nor can they be sure the estimate will be valid

(Please turn to page 220)



FULL-POWER TESTS enable technicians to check for ignition weaknesses such as plug shorts under load by means of input adjustments to the oscilloscope

JAN. 1966



ULTRA-ACCURATE Merrill tester, standard at most new centers, spins the front wheels at the equivalent of 40 mph, and measures caster, camber, toe-in



Like a ferris wheel. In the space it usually takes to park two cars, the Wulpa Parking Tower can accommodate 20 vehicles in its 79-foot steel structure. Hitched to a chain, compartments can be rotated at the push of a button to permit parking and retrieving of cars by their owners.



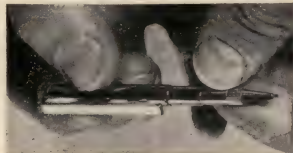
It's a mad rush. Because of the distance from the ready room to the flight line, Marine pilots of Marine Aircraft Group II at Da Nang, Vietnam, now scoot for a scramble. They bought the motorbikes to cut down the time needed to answer alerts.



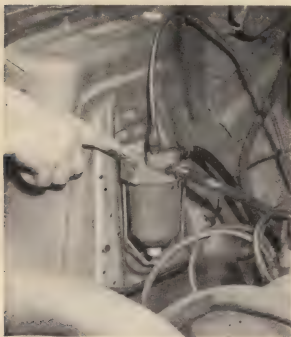
Robot practice green for indoor-outdoor use tilts up, down, left, right or any combination of these at touch of a pushbutton. Measuring 9 by 4 feet, Roputt has a simulated bentgrass top to approach actual conditions for various putting situations. Four Micro Switch pushbuttons (bottom photo) control motor-driven jacks, operating from 110-volt outlet. Unit weighs 175 pounds and is priced around \$350 by Wichman Industries Inc., 7110 S. France Ave., Minneapolis, Minn. 55410.



Supersonic missile TOW (tube-launched, optically tracked, wire-guided) automatically scores bull's-eye on moving or stationary tank-sized target more than mile away. Army gunner simply aims through telescopic sight and launches the missile, which flies to the target as he keeps crosshairs aligned on it. Hughes Aircraft Co. is developing the new antitank device, which fires from a variety of military vehicles or a ground tripod.



Take note of this tie clip. Only 2 $\frac{3}{4}$ inches long, a gold-plated tie clip is attached to a telescopic chrome mechanical pencil that expands in three sections for writing. It is priced at \$2.95 from Gene Mueller Co., 1100 N. La-Salle St., Chicago, Ill.



Auto thieves get the surprise of their lives when the stolen car runs out of gas a half mile from where it was taken, thanks to Gaslok, a small supplemental gas container installed between the main tank and the fuel pump. When Gaslok is turned on and locked, the main fuel supply is cut off, leaving enough fuel to move the car in a parking lot. It is priced at \$15 from Fisher Machine Shop, Inc., 11704 Inglewood Avenue, Hawthorne, Calif.



New Coast Guard image—well, everybody else is doing it!—will include a bold slash of color on all ships and aircraft. The Coast Guard shield of blue and white will be imprinted over the huge slash of international orange. A smaller slash of white separates the orange from a trailing slash of blue.

THE GREAT RELAXING BONANZA

By Walter Ian Fischman

Feeling tense? Can't sleep? Let the sleep merchants pamper your nerves with musical beds, silent alarms and piped pine scent; or cry yourself to sleep on a waterproof pillow with a decision-making case



FROM THE PLUSH but nervous-making bastions of New York's Madison Avenue to the so-called restful valleys of California, there's a disturbing trend in progress. Tension is on the rise. All across the land, day-by-day pressures and irritations have zoomed out of control. Even the mere routine of living can rub raw the nerve endings of emotion until some chance circumstance triggers a wild case of screaming hysteria.

A bathroom faucet drip at 3 a.m. can multiply to sledgehammer intensity. Ditto for the coffeepot that boils over or the cacophony of car brakes just outside the window. Without logic or sense the pace-that-kills has mounted in intensity and there's no letup in sight.

The only happy note in this sad picture is the skyrocketing popularity of the tension easers. The frantic search for relief has given rise to a booming new mass market: the relaxing bonanza. Clamoring for attention are a fantastic assortment of pills and potions, gimmicks and gadgets, all designed to unwind spring-taut nerves, relax muscle spasms or bring euphoria to a migraine-muddled mind.

Spearheading the parade of unwinding aids are the tranquilizers. Sales of these "happy pills" totaled a half billion dollars last year and are still climbing.

The barbiturates—the sleep-producing drugs—are an entirely different story. Medicines such as Nembutal and Seconal (affectionately tagged "yellow bombers" and "red sluggers") do not ease the fears, anxieties and tensions of modern living. Instead, come nighttime, they clobber the conscious mind into accepting sleep. And red-eyed insomniacs watching the sky lighten outside the window gulp them in ever increasing quantities. Doctors, alarmed at the senseless, careless drugging, have tried to stem the tide, but Americans, frantically reaching out for "just one night's good sleep," continue to stagger to the medicine cabinet.

All this despite the fact that there is no real Rx to happiness. "Man can-



not solve his problems of daily living with a pill," says Dr. David P. Allman, president of the American Medical Assn. The Mental Health Assn. also decries all the running away from fear and worry. According to that group, anyone who doesn't worry is truly a candidate for the laughing farm. We live in a tempestuous era and only a vegetable or a mind so warped that it makes no contact with reality can be utterly free of worry. A little anxiety is normal. It's the balance that's so hard to come by.

For most people, the dark hours after sundown are the roughest. With wry humor, confirmed insomniacs tag these open-eyed periods, "cultural hours." But apparently, sleep has always been a problem.

King Louis XI, who looked after France in the 15th century, had his own approach to sleep. He never got up. The royal throne was a great, billowy, ornately carved bed. The official name for this rig was "Lit de Justice" (bed of justice) and his majesty conducted the business of France while flat on his back with

the comforters tucked neatly under his chin. There were members of the royal court who served Louis for years without ever seeing his imperial highness assume anything like a vertical position.

The top authority on the sleep habits of Americans is neither a doctor, psychologist or researcher. He is Norman Dine, the proprietor of New York's gadget-stuffed "Sleep Shop." During the past 25 years he has helped thousands of restless human beings drift gently off to sleep. According to Dine, physical tension and emotional tension are firmly linked together. If you can unwind one—either one—the other also goes limp. While psychiatrists concentrate on relaxing emotional tension, Dine tackles the other side of the



problem. With over 3200 gadgets on his many shelves, he sells physical ease.

These unrest cures range from a five-foot bookshelf of do-it-yourself relaxing texts to an incredible array of gadgets. Most expensive item in the emporium is a \$1500 bed with a push-button-controlled mattress that flexes fore and aft like an awakening cobra. The contortions can be manipulated for reading or just easing leg muscles. A vibrator hums restfully while it massages. Soft music on a hi-fi tape recorder combines with a time sunlamp to ease the tensions of the



day. If this doesn't do the trick, a flick of the finger will send out the tranquil aroma of a pine forest while a motor-driven control slowly dimsthebedlamp.



Deluxe bedlamps equipped with an intricate assortment of lenses funnel the light down to a narrow, page-size beam that leaves the rest of the room in darkness. To hush the faint on-off click, the lamp uses a silent mercury switch. A noiseless alarm clock awakens with a beam of light. The effect can be restricted to one side of a double bed, thereby sparing a late-rising bedmate. A strange set of right-angled "Bedspecs" will permit you to read in bed stretched out flat and relaxed. Remote controls attach to fan, radio or lamp so you can click them off from bed with a lazy jab of a fingertip.

Silent radios have a palm-sized speaker that murmurs softly under your pillow. There's a little switch that fits under one leg of your bed and automatically turns on a small night light to illuminate the floor should you arise at night. Bright red nightcaps complete with tassel are back to deflect drafts from a sleeper's thinning thatch. And if cold feet are really a problem, a set of electrically warmed anklets will bring them up to temperature. To spare you that morning shock, there's a French alarm clock that gently coaxes you awake with the tinkling music-box strains of a waltz.

Pillows come in infinite variety from small to jumbo in size and from limp to plump in filling. A special contour pillow will cradle your head without bunching up at the shoulders. An even more intricately shaped headrest has cutout edges like a jigsaw puzzle. If you can't find a comfortable head surface with this assortment, you're too tense for science.

If things are really tough, cry yourself to sleep on a Heart-ache pillow. The waterproof surface will emerge unharmed by your hot little tears, thus saving you the tension-producing worry about soaking the bed. If, like the guy who sorts eggs, it's the decisions that are tying



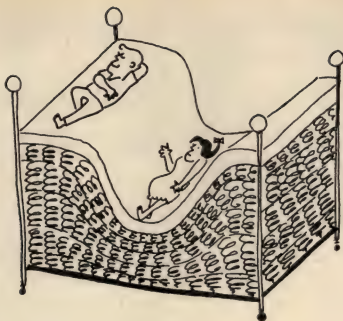
you up in a knot, try a decision pillow-case. One side says "yes"; the other, "no."

Even basic slumbertime accessories are getting more complex. Time was when a man stifled a yawn and announced that he was going to hit the hay, he did just that. He unlaced his boots and stretched out on a huge sack filled with hay, straw or maybe corn shucks. Nowadays, just the simple process of picking out a sleeping surface can create a nervous wreck.

First of all, there's the firmness factor, carefully worked out on a scientific basis. The degree of "give" starts at 20 percent, which offers the approximate resilience of a subway platform. From here you can go all the way up to a fleecy softness of 90 percent. It's a matter of personal taste.

Travelers who have wandered off the turnpikes into the rockbound recesses of Maine or Vermont claim that feather beds are still in use. Slipping into one of these is not a casual affair. The accepted technique is to dive in over the footboard. The huge billowy mass of mattress sinks down in the center while the sides fold over you like a cobra digesting an egg. It is, according to all reports, an unnerving experience.

Currently underway is a huge research program backed to the tune of several million dollars by the Simmons Mattress Co. Trained scientists are taking a close look at the sleeping pattern of the average American. Volunteer sleepers are paid a fee for snoozing nightly in a laboratory bedroom. Before turning in, each



volunteer is connected up to a mass of wires that record each twist, turn and sleep-muffled contortion. As the data is cataloged (the belly sleepers sorted out from the side curlers and the snorers separated from the groaners), researchers have come up with recommendations for a host of changes.

Mattresses six inches longer are now being manufactured to accommodate our skyscraping younger generation. The standard 54-inch-wide double bed is gradually giving way to the 72 or even 78-inch-wide king-sized number. You can buy a sort of "his-and-her" mattress, one side firm and the other soft. Available on custom order is a mattress with a built-in bundling board; keeps husband and wife from "clonging" together in the center of the bed like a couple of Coke bottles in a hammock. Hair stuffing, once the aristocrat of mattress fillings, has long since relinquished the title to foam rubber, and even this bouncy bedding is giving way to a new type of plastic foam.

Color consultants have elbowed into the relaxing act. According to Hal Antin, tint and hue adviser to the Sapolin Paint Co., you can't always blame your 3:00 a.m. pillow-thumping on the salami sandwich you ate just before bedtime. The color of your bedroom walls may be the cause of your insomnia. If so, switch to beige, advises Antin. Pale yellow, soft gray or light

green will also ease your path to slumber, but avoid red at all costs. With this hot, aggressive color encasing your boudoir, sleep will come slowly and you'll awaken with the temperament of a hungover bear.

Alan Murray, the world's most expensive shoemaker, tackles the anxiety problem from another direction. "When your feet are happy . . . your body is happy," says Murray. The custom footwear he turns out are molded from a plaster cast of the customer's foot, fit like a glove and, according to thousands of customers, afford incredible comfort. Totally different from any other footwear on the market, these ground grippers are short, wide and contoured inside to cradle each toe and callus. Price: \$75 and up per pair.

Addicted to these "space shoes" have been a host of pavement pounders ranging from mailmen and traffic cops to Danny Kaye and Mrs. Litvinov, widow of the former Russian ambassador, which would seem to indicate there is tension behind the Iron Curtain.

For easing his own tension, Murray follows an offbeat system. He has the only private ice-skating rink in midtown Manhattan. It's in the rear of his shop where customers, their feet encased in slowly hardening plaster, can watch him gracefully twirling in figure eights, arabesques and other maneuvers befitting an expert.

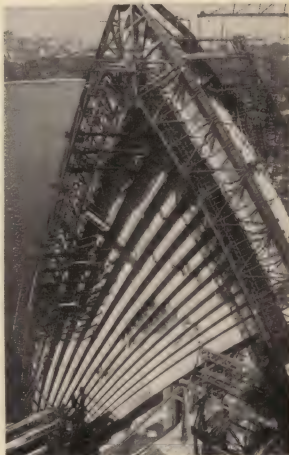
(Please turn to page 210)



Riot protector. A bottle smashes harmlessly against a clear polycarbonate plastic shield designed to help riot police ward off flying bricks, rocks and other objects. The Polyguard shield has a built-in arm shock absorber of foam. It's made by Rowland Products Inc., Box DA2, Kensington, Conn., and is priced at \$29.95.



Don't move the patient, is a time-honored warning when there may be neck or spine injuries, and Dr. William Terry of San Diego State College has devised a rescue board for diving and swimming accidents that serves as a body splint. Made of $\frac{3}{4}$ -inch plywood, the board is six feet long and two feet wide; there are handles 18 inches from the end on both sides, and auto safety straps at top and bottom secure the victim at the shoulders and knees, keeping the body rigid while being moved.



Sail-like "shells" of pre-cast concrete form the controversial roof of the Opera House in Sydney, Australia. Special scaffolding and tower cranes were required to support and raise these huge "shells," which will be clad with Swedish ceramic tile resembling old Ming china. Because of its location on a peninsula which juts out into the harbor, the 100,000-ton structure also demanded extensive piling and foundation work.



The Hodag Endurance Run: **Snowmobile Shakedown**

Frozen washboard lakes, swamps, tangled woods, bone-shuddering corduroy roads scramble brains and jar innards — but even the novices try to win

By Stuart James, PM Outdoors Editor

SPECTATORS LINED the snow-packed, downtown street in Rhinelander, Wis., their bodies canted out and heads turned toward the starting gate where 107 snowmobiles snarled and popped, double-filing toward the start of the Hodag 35-Mile Cross-Country Marathon.

They were starting two machines at a time at ten-second intervals. My turn was coming up. I remember looking down that channel of people, my hand nervously revving the throttle of the snowmobile, and thinking, "I hope I don't run over somebody before I even get out of town."

Then I was in the starting gate, and I was recalling my five minutes of instruction in snowmobile driving. "You just press your thumb on the throttle and away she goes. Nothing to it.

You can sit down to drive it, but most fellows kneel on the seat to get better control." I was kneeling. Until the day before I had never seen a snowmobile, but I wanted to at least *look* like I knew what I was doing.

We were off. The machine next to me roared out ahead. I was mostly concerned with not maiming anyone. We went a block on the hard-packed snow, made a right turn and roared across a vacant lot. I was getting the feel of the machine and it seemed as though the race was going to be a snap. At the end of the lot there was a small hill, a sharp turn and the course dropped down to a lake. There was a crowd of people at that spot.

Now, on a snowmobile, when you make a sharp turn at full speed, you're supposed to lean off to the side in the direction

you're turning. If you don't, particularly if you're kneeling on the seat like a real pro, you'll get thrown off on your head.

As usual, I learned it the hard way. I should have known that crowd was waiting down there to be entertained. I gave them the best laugh of the day.

But I picked myself up, staggered around until I found the machine, and then got it out on the lake. There was about three miles of open track, and I thought that it was going to be fun.

Let me tell you about snowmobiles. I was driving a Johnson Skee-Horse, which is essentially a tractor tread with a seat on it, a pair of skis out front that are steered by handlebars, and a 14-hp engine that turns the tread off a chain drive. Now this machine weighs 369 pounds and there are no springs, and the closest thing to



WARMING UP, a squadron of snowmobiles churns up clouds of snow as the vehicles growl across a snowfield prior to the start of the race. Out of a total of 107 starters, accidents and engine trouble took their toll of 19 machines



FIGHTING FOR POSITION on a narrow trail is tough enough, but trees and underbrush make it even more difficult



OPEN TRAIL is unusual in a cross-country endurance run, but even this is a jarring experience taken at top speed

driving it across a snow-covered lake at 40 mph is being strapped to a jackhammer that is running amok in a granite quarry.

But, wait; there's still 32 miles of this winterized lunacy to go.

The course was marked with flags, but as I neared the end of the lake I thought there was a mistake. The flags seemed to indicate that I was to plunge straight into dense woods. It was no mistake.

I followed the narrow, twisting trail, and ducked down behind the plastic windshield to avoid being slapped off by low-hanging branches. I came down a sharp drop, skidded around a turn, didn't make it and slammed into a tree. I sailed over the windshield, glanced off the tree and landed in the deep snow. I wasn't hurt, but the snowmobile was smacked up close to

(Please turn to page 218)



KNEELING ON THE SEAT enables the driver to shift his weight quickly from side to side for turns and also stand up to absorb the shocks with his legs



LAYING INTO A TIGHT TURN, the drivers lean far out to counterbalance the weight of the machines and slide them around. Polite tactics give way to every-man-for-himself when they're battling for position like this

Sledding at a mile a



BLURRING THE LANDSCAPE, a Simko Power Sled flashes across the ice at top speed. The driver is leaning to put his weight into a turn to attempt a slide, but even with this maneuver the sled has been designed with such stability that the turn was still wide

minute

"ICE BOATING is a great sport," said Jim Simko, "but I wanted something that would give the same thrills and wouldn't be such a prima donna about weather and ice conditions."

The result was the Simko Power Sled, a go-kart on runners that rockets over the ice at 60 mph, and is so safe and easy to run that a 10-year-old can handle it with ease.

Muffled against the biting wind of a Michigan cold spell, I accompanied Jim Simko to a small lake on the outskirts of Detroit where two dozen ice-sled enthusiasts were racing pell-mell from one end to the other.

The sled is a tubular steel frame with angle iron runners. A Briggs & Stratton 10-hp engine turns a toothed wheel under the sled that just barely bites into the ice. It has a centrifugal clutch and a hand-operated dead man's throttle. A steering wheel turns a pair of rudders at the rear, and it is equipped with a comfortable bucket seat.

I took this rig out and did everything to try to spin it out or turn it over. Impossible. At top speed I jerked the wheel left and right. I only fishtailed. And yet you can race it in formations and it handles beautifully. I took it over a submerged log at top speed and it just sailed through the air, landed and went into a long, graceful slide. In that one afternoon I became a complete fan of power sledding.

A single-passenger sled sells for \$199 complete, but you can also buy it in a kit and a set of plans costs only \$3 from Simko Power Sleds, 4420 West Jefferson, Ecorse, Mich.—*Stuart James*



TURNED BY CHAIN DRIVE off a kart engine, the source of locomotion is this wheel with adjustable teeth that just barely bite into the ice surface



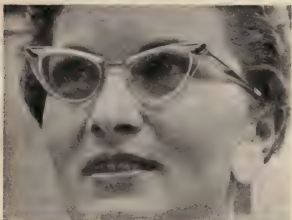
SLED RUNNERS are angle iron welded to the tubular steel frame. The sharp edge, acting like the edge of an ice skate, adds to the sled's stability



DEAD MAN THROTTLE is a safety device. It must be held forward to activate the engine; when it is released it automatically cuts off the power



Chopper dropper. Lives of passengers and crew in about 80 percent of helicopter crashes could be saved by destroying the rotor blades and parachuting the copter to earth. In Navy tests the pilot pulls a handle which fires a cartridge that cuts the rotor shaft and separates the rotor blades (top photo). Simultaneously, rockets propel the severed parts free and parachutes shoot out of containers (lower photo). Tests have been done from as low as 200 feet.



Reactionary spectacles. Eyeglasses that darken on exposure to sunlight and then become clear again indoors or after sundown are the end product of a new ophthalmic glass developed by Corning Glass Works. After a one-hour exposure to direct sunlight at 85° F., light transmittance of the new glass drops to 66 percent, similar to lightly shaded green sunglasses.



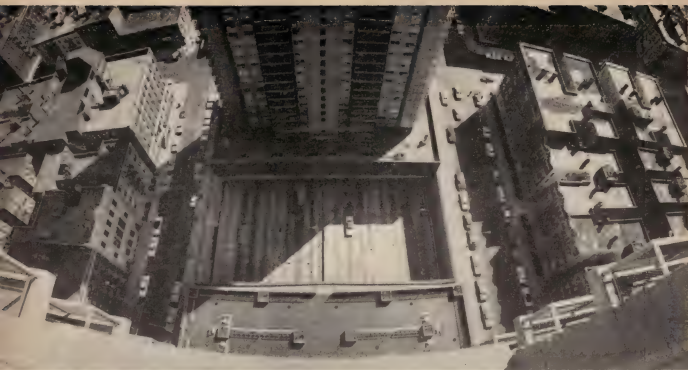
Skateboard brake. Attach the Surfbrake to your skateboard for a braking action that won't interfere with steering or balancing. The self-compensating pedal is designed to avoid abrupt stops and is easily detached or made inoperative at will. It's supplied in kit form by Electro-Mech Industries Inc., 825 New Hampshire Ave. N.W., Washington, D.C. 20037.



Battlefield fuel supply is neatly delivered in a rubber self-sealing drum by a Wessed refueling helicopter, newly developed for Great Britain's Unison 65, formerly called the commonwealth interservice study.



Great Lakes super ship, SS Tarantau is 730 feet long and has a depth of 40.5 feet and breadth of 75 feet, allowing her to carry 30,000 tons of coal or rock. Three conveyor belts running through the bottom of the hull can unload 4200 tons of coal an hour. A 9000-hp steam turbine powers the ship, which is owned by Canada Steamship Lines.



NO BASEMENT RUNS UNDER THIS APARTMENT building. Instead, there's a highway leading to the George Washington Bridge. Steel trusses span the roadway and support the massive structure

No land? Then build it on air!

The hardest thing to find in a modern city is vacant land. So real estate men erect giant structures over railroads, highways and even other buildings

BY CREIGHTON PEET

IN CHICAGO, BOSTON, NEW YORK and other big cities, real estate men more and more frequently are closing multimillion-dollar deals that involve parcels of empty air. That's right—air. It's perfectly legal, too. Builders use these "boxes" of air space to put up skyscrapers over railroad tracks, subways, highways and even other buildings.

One of the hardest things to find downtown in our cities is a vacant lot. So builders have to knock down existing buildings or acquire air rights.

Air rights are more substantial than they sound. You control air rights to a piece of property if you own your own home. Walk outdoors and look straight up. According to our man-made laws, you (and perhaps your mortgage company) own a slice of the heavens for as far as you can see. It's all yours, an infinite number of heavenly cubic feet.

That's the kind of "property" that some real estate agents are now selling. But buildings constructed on air rights have unique problems. For instance, they usually have small basements, often none at all. Their only contact with solid ground is through long steel legs reaching down into another owner's land.

New York City's Waldorf-Astoria Hotel, which fills a solid city block, is built on 216 steel piles. It sits over two levels of main line railroad tracks



IN ALL, FOUR 32-STORY APARTMENT HOUSES and a bus terminal (behind them) straddle the 12-lane highway on the west side of New York City. Beyond the bridge is the New Jersey shore



LOOMING LIKE A GLEAMING MOUNTAIN above the Illinois Central tracks in Chicago is the Prudential Building. It stands 41 stories high and is reported to have cost \$42 million



A SIMILAR CONSTRUCTION PROBLEM was involved in putting up a big office building on New York's Park Ave. Trains continued to roll while the steel foundation was put in place

and a railroad yard, and, as a consequence, has a very small basement area. Its wine "cellar" is on the fifth floor, steam for heating its 47 floors is supplied by a utility plant some 15 blocks away, and all its laundry is washed in a remote part of town.

Having no basement gives rise to other problems. Two recently completed Park Ave. skyscrapers, the Pan Am and the Union Carbide Buildings, start their elevators on the second floor because there is no room for essential elevator pits below the street level. That space is used by the New York Central R.R. Thus, the pits are on the first floor in each case, and escalators take tenants to elevators on the second.

Sometimes these valuable parcels of aerial real estate cover 50 acres or more. And sometimes deals involve structures using hundreds of thousands of cubic feet of air space entirely inside another owner's building, but not touching it at any point. Perhaps the smallest air-rights agreement in existence involves the \$25 a year that the city of New York collects because an aluminum lady's bosom projects more than 18 inches beyond a front building line. The city claims that the lady—a statue on the facade of an art gallery—constitutes an infringement of the air rights over a city street.

Bridges between buildings over city streets are commonplace, and the same type of air-rights arrangement is even used for big projects. One of the most monumental to date consists of four 32-story apartment houses that straddle the 12-lane approach to the George Washington Bridge on the New York City side. Each of the steel bridges supporting these buildings consists of four trusses 10 feet tall and 45 feet long. Air rights were sold

by the city to the developers for \$1,100,000.

Air rights are usually leased for those big electric signs you see on buildings. Similarly, eight of the best paying tenants of the Empire State Building use space above the roof. They're the eight television antennas fastened to the 222-foot steel mast anchored to the roof above the 103rd floor.

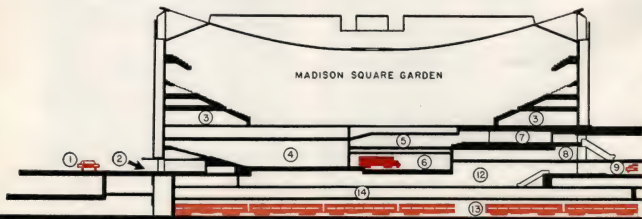
The towerlike top of the building is very strong. Built in 1932, when the dirigible was still giving the airplane competition, the tower was designed to be a mooring for the big lighter-than-air ships. Special steel bracing was installed in the tower to enable it to resist tugs from wind-buffed dirigibles.

Though never used as a mooring, the strong tower made it safe to add the TV mast in later years. Today, rent from the eight antennas has made the slender column of air space above the 103rd floor worth around \$700,000 a year.

The narrow width of New York's Manhattan Island encouraged the building of skyscrapers, and later the development of air rights. The first of the big air-rights projects was started in 1913 when Grand Central Terminal was built on top of a steel and concrete roof stretching over 29 acres of railroad tracks. By covering the tracks, builders transformed a dirty, shabby "railroad avenue" into the Park Ave. We know today, one of the plushiest and most valuable pieces of real estate in the country.

Between 42nd and 52nd Sts., in addition to Grand Central Terminal, some 23 luxury apartments and hotels were built. In recent years, many of those buildings have been replaced with tall office buildings, making the air-rights revenue to the railroad greater than ever.

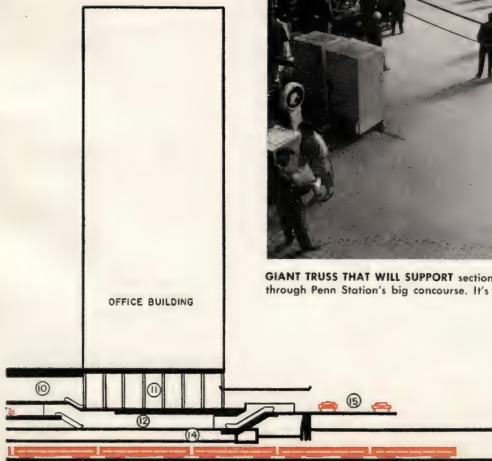
And now Pennsylvania Station, the sec-



CUTTING TORCHES, sledge hammers and giant cranes are transforming New York's Pennsylvania Station into the new Madison Square Garden Center. Situated above the railroad facilities will be an office building, various entertainment areas and a sports arena with a top capacity of 22,000. A diagram (below) of the project shows: 1. Eighth Ave. location; 2. amphitheatre; 3. exhibition hall; 4. the 4000-seat amphitheatre; 5. bowling center; 6. truck unloading area; 7. museums; 8. sports center; 9. taxi drive; 10. enclosed mall; 11. entrance to office building; 12. railroad concourse; 13. track level; 14. railroad concourse, and 15. Seventh Avenue location



GIANT TRUSS THAT WILL SUPPORT section of new center runs right through Penn Station's big concourse. It's anchored on steel "legs"





BIG TARGET for developers is the expanse (left) above the Illinois Central tracks in Chicago. Area between Prudential Building (left) and new apartment house is tied up in litigation. The drawing shows how the area may look after construction in future

and big railroad terminal in New York, is being demolished. It will soon be replaced by a vast new Madison Square Garden, a 29-story office building, a movie theater, bowling alleys and other facilities, all occupying air space above a shrunken, below-ground railroad station.

Intricate structural problems often complicate air-rights construction. When the new 38-story CBS Building was put up recently in New York, air rights over a two-track subway line, which runs diagonally under its basement, were involved. To support the skyscraper, some of the most massive short pieces of steel fabricated in recent years were placed to form a bridge over the subway.

The subway line had been built some 30 years before when the land was occupied by small brick buildings, many only four to five stories high. They were adequately supported by the subway's concrete slab roof. But a lot more support was needed for a 38-story building.

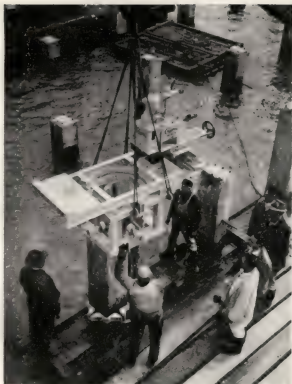
Another type of air-rights arrangement involves using space within an existing structure. Some years ago, Bell

Laboratories gave the New York Central System permission to construct a tunnel carrying a two-track freight line through their building in lower Manhattan. Since it was feared that the movement of cars would cause vibrations that might interfere with delicate electronics experiments, a steel framework to support the two tracks was built inside the third and fourth floors of the Bell Labs Building.

The framework doesn't touch the Bell Building at any point; it rests entirely on its own steel supports sunk 86 feet below the street. The tunnel involves 250,000 cubic feet of air space. Use of this line was discontinued some time ago, but the railroad still has its tracks and its air rights.

There have been cases where air-rights tenants have been troubled by vibrations from traffic underneath. Some years ago a sensitive guest on one of the upper floors of a Park Ave. hotel complained that she was being kept awake by the rumble of trains. Though no one else could hear anything, the woman was so insistent that engineers investigated.

(Please turn to page 222)



Concrete-cutting saw. Capable of slicing through reinforced concrete, the saw is used in Australia, where it was developed, to lop the tops from harbor piles. It has a diamond-edged blade that's horizontally mounted, driven by compressed air and water-cooled. The saw's frame, which is adjustable, is dropped over the top of the pile. The tool can cut piles up to 18 inches square.



Jumping alligators at Homosassa Springs, Fla., have learned that a clanging dinner bell means a free meal—a fishy morsel, usually mullet, dangling on a string. Never rated among the smartest of wildlife, the 'gators became adept at jumping as much as two-thirds of their length.

After determining that they would jump for mullet, the feeder experimented with marshmallows. At the sound of a crushed plastic container, the alligators would jump. However, white sponge or white sack substitutes were rejected by the creatures.



Collapsible five-gallon jug folds into a two-inch-thick package weighing only one-half pound. Ideal for camping or boating, the polyethylene Lug-A-Jug is priced at \$2.19. It's made by Dewitt Plastics, Auburn, N.Y.

NEW FOR
YOUR HOME
 BY MARION MOREY



PEWTER WAX gilds or restores almost any surface. Apply with finger or soft cloth, let it dry one minute and buff to luster. Price: \$2 per one-ounce jar. Offered by Connoisseur Studio, P.O. Box 7187, Louisville 7, Ky.



STICK CLIPS of metal adhere to any clean, dry surface and hang whatever you need hung. Open clips, slide them onto material, press to wall or window. 6 for 39 cents: Klip-Stix, 58 Seabring St., Brooklyn, N.Y. 11231



DOOR SIGNS stop annoying doorbells. Plastic messages hang on doorknob, cover most occasions. Even preschoolers can understand them. \$1.50 per set of 12. World Wide Products, Box 2857, San Francisco, Calif.



BATTERY-OPERATED PORTABLE CLOCK runs for a year with good accuracy on a single "C" battery. Mounted in a $3\frac{1}{4}$ by $3\frac{1}{2}$ by $2\frac{1}{2}$ -in. gray plastic case, the clock suits car, boat, camping, travel and home use. A fiber-mesh base lets you position clock on metal, wood or plastic; it adheres firmly, resists jolting. Simply glue bottom mesh piece where you want it and set clock on it. Unit costs \$19.75 from Gilwin Corp., 250 Culver Ave., Jersey City, N.J.



COIN COLLECTOR'S CLAMP takes the smudge out of numismatics; the plastic tool picks up and holds securely any size coin from any surface, including glass. You don't have to touch a coin with your fingers. The grip-tight jaw of the clamp permits safe transfer of coins in either a vertical or horizontal position and allows you to use a magnifier while holding a coin in one hand. For beginner or advanced collector, the clamp is 69 cents. Bemco, Inc., Kasson, Minn.

tic



MURDER WEAPON is photographed on light box in elaborately equipped police laboratory

CAMERAS TO TRAP CROOKS

The face on the car door, imprint on fabric, the mark of a paint rub—cameras found these telltale clues and sent the killers to jail

By Arthur J. Maher

ONE DAY IN 1957, a masked man strode into the office of a Cleveland savings-and-loan. While the man brandished a gun, a woman accomplice emptied almost \$2400 from a teller's cage into a paper bag. Then the two hurried out to a waiting car—driven by a second woman—and sped away. A fast robbery, well planned and neatly carried out—except for one minor detail. The whole thing had been recorded on film.

The savings-and-loan, which had been robbed so often that some called it the shooting gallery, had installed a secret movie camera only the day before. Within hours, television stations in Cleveland and other cities were showing the world's first televised bank holdup. Next day, the masked man surrendered. He'd fled to Indiana, but upon learning of his "fame," realized the proverbial jig was up.

Meanwhile, still photographs taken from the film had led detectives to the driver of the getaway car and a boy friend who'd provided the car in return for \$1000 of the loot. Finally, an anonymous phone call helped to locate the woman



PHOTOGRAPHING CLOTH from the trousers of hit-and-run victim proved suspect's truck bumper flattened corduroy nap. Imprint convinced jury



SNOWPRINT TRAPS BANDIT. In their haste to get away, two men who had just held up a Canadian loan company backed their car into a snow drift. Police photographed imprint of license for evidence. Men were caught in hours.



X-RAY PHOTOS PROVED DICE (above, left) were loaded. Cutting dice open would have made it impossible to show how loads insured seven at every roll. Photo at right shows how X-rays detect contraband hidden in heel of shoe



with the paper bag. Another woman, viewing the holdup on TV, noticed something distinctive about the way the girl bandit popped open the bag. Later, watching a rerun of the film, she remembered that she'd once noticed a certain supermarket cashier had a characteristic way of opening paper bags. Her phone call led to the guilty party. All four suspects were convicted.

In another case, a Manhattan Beach, Calif., nursery was burglarized five times during 1956. Each time, the culprits had broken a window pane in an adjoining hothouse, then the door between that hothouse and the nursery. In January, 1957, the owners wired a hidden camera and infrared flash to snap when the door was opened. Every night upon closing, they religiously set the camera mechanism for action.

One morning, they found that the shutter had been snapped. Local police rushed the infrared film to the FBI, which developed a clearly identifiable shot of two men entering the nursery. Circulation of this picture, which showed a tattoo on one man's right arm, led to arrest of the suspects.

The above two cases are far from unique. They are presented here as typical of the thousands of cases each year in which photographs help bring criminals to justice.

The use of photographs in crime detection is almost as old as photography itself. In 1841, for example, two years after Louis J.M. Daguerre invented the daguerreotype process, the Philadelphia Public Ledger reported, "Whenever any suspicious person or criminal is arrested in France, the officers have him immediately daguerreotyped and he is likewise placed



FLOODED RIVER carried murder victim's body from point 3 to 2. To prove this at trial, a sheriff photographed river before water receded to normal banks

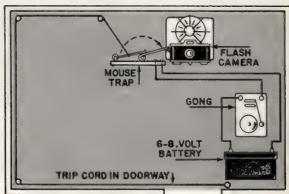
in the criminal cabinet for future reference. . . ." And one historian reports that in 1839 an irate husband spiced a divorce trial with a daguerreotype taken of his wife during a tryst.

In this country, the San Francisco police department used mug shots to speed identification of criminals as early as the mid-1850s, and in New York City, a rogues' gallery of 450 ambrotypes (an early, short-lived photo process) was established in 1858. Other cities were quick to follow suit, with the result that an estimated 5000 to 6000 men are now active in police photography, spending \$8 to \$10 million a year on photo supplies.

The variety of crimes now solved through, or with the aid of, photos ranges from the use of loaded dice to homicide. In connection with the latter, Sheriff Bailey Grant, Ouachita Parish, La., used



GATHERING TRIAL EVIDENCE, European police often take stereo shots of accident scenes with photogrammetric instruments. Photos aid figuring of distances



CROOK TAKES HIS OWN PICTURE and sets off gong when he breaks trip cord. This springs mousetrap which triggers infrared camera and rings the gong

photos to show a jury how the body of a murder victim could be washed from the scene of the crime to a point $1\frac{1}{2}$ miles away. At the time of the murder, the Ouachita River in northern Louisiana was flooded. By the time of the trial, however, it had receded to its normal banks.

Grant and a deputy, anticipating this problem, had photographed the area from a light plane to show clearly the river's channels and flow at flood stage. Without such photos it would have been impossible to show how the body reached the point where it was discovered. The suspect in this case was convicted and sentenced to death.

Photographs also proved decisive in a Massachusetts hit-and-run case. Shortly after alighting from a school bus, a 10-year-old boy was struck from behind and

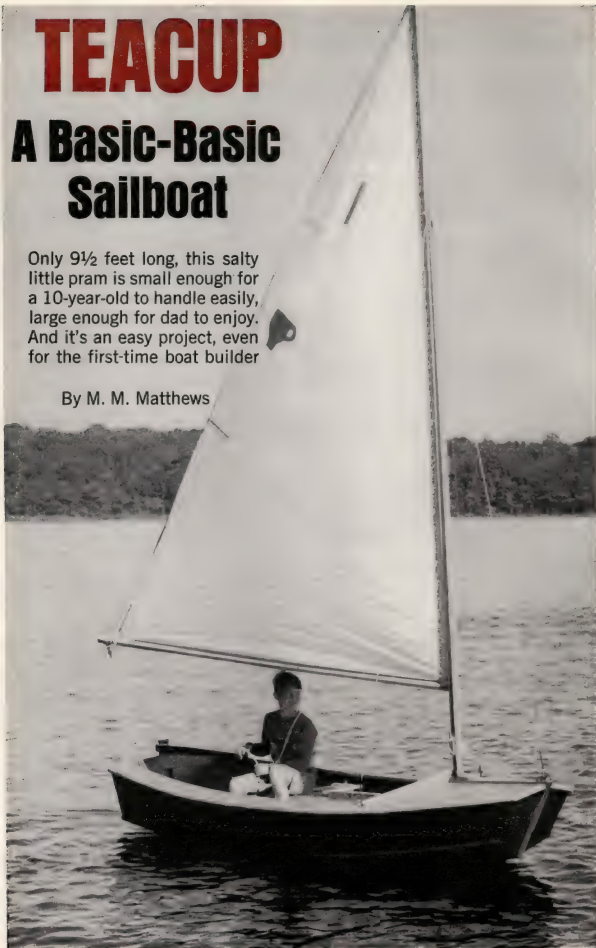
(Please turn to page 208)

TEACUP

A Basic-Basic Sailboat

Only 9½ feet long, this salty little pram is small enough for a 10-year-old to handle easily, large enough for dad to enjoy. And it's an easy project, even for the first-time boat builder

By M. M. Matthews





TEACUP'S SAUCER is a simple 2 x 4 cradle mounted on wagon wheels. Build it to provide support for the hull at frame 3 and at the bow, padding where necessary with strips of carpeting to avoid marring the finish. Using this simple storage dolly, even the young sailor at right has no trouble when launching and hauling out

TTEACUP IS A DESIGN that gets right down to the basics.

With almost 5 feet of beam, it's a stable sturdy craft that handles nicely, an ideal learner's boat. While not a hot boat, by any means, *Teacup's* performance has enough sparkle to make this a fun little day sailer for anyone.

Construction is a blend of economy and simplicity. To simplify the two most difficult parts of hull building, *Teacup* has a pram nose instead of a curved bow and a dagger centerboard rather than the more complicated swing-up board. Even the sail plan is simple.

If you've never tried your hand at boat building, *Teacup* is a perfect choice as a first project. Dimensions were planned to utilize 10-ft. sheets of plywood, available on special order from your lumber dealer.

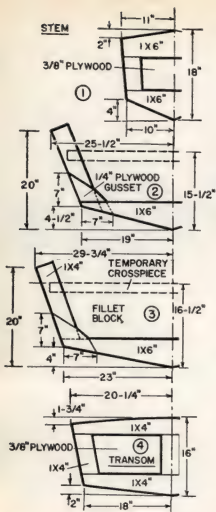
Naturally, 8-ft. sheets might also be used, but this will require butt joints in the planking.

Frames and form. Begin frame construction by laying out full-size patterns of the stem, frames, and transom on large sheets of heavy wrapping paper. The stem and transom frames are backed with $\frac{3}{8}$ -in. exterior plywood. Gussets for the No. 2 and No. 3 frames are $\frac{1}{4}$ -in. plywood. Use waterproof glue and flathead No. 7 x 1-in. screws to assemble the frame members. Temporary crosspieces should be clamped in place until the frames have been checked on the building form.

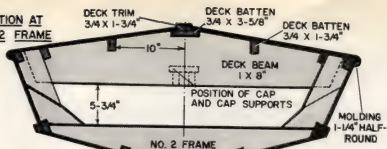
For the building form, you'll need two straight 2 x 4s. The ends are cut to length and angled as shown on page 149. Make angled cuts accurately, because the stem and transom will be positioned directly on



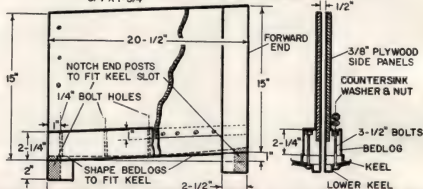
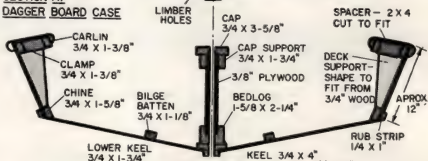
STEM



SECTION AT NO. 2 FRAME

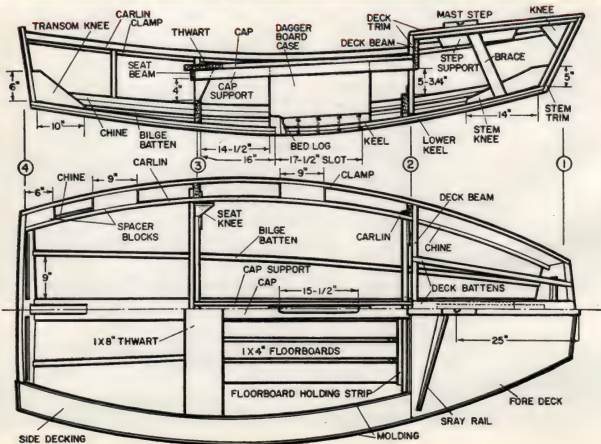


SECTION AT DAGGER BOARD CASE



FRAMES

PLAN AND PROFILE



Keel, chines and clamps. It won't hurt to leave a few inches of extra material on each end of the keel. These ends can be removed and the keel sanded flush with transom and stern when the frame is faired.

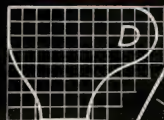
The hull frame is now ready to be trimmed and faired. The keel, chines and

149

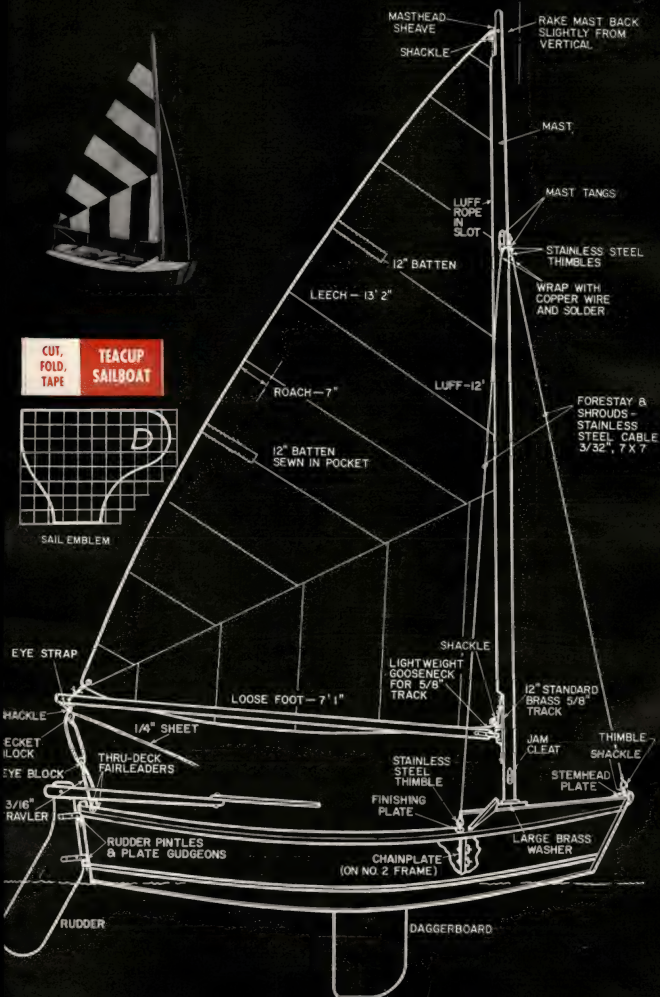


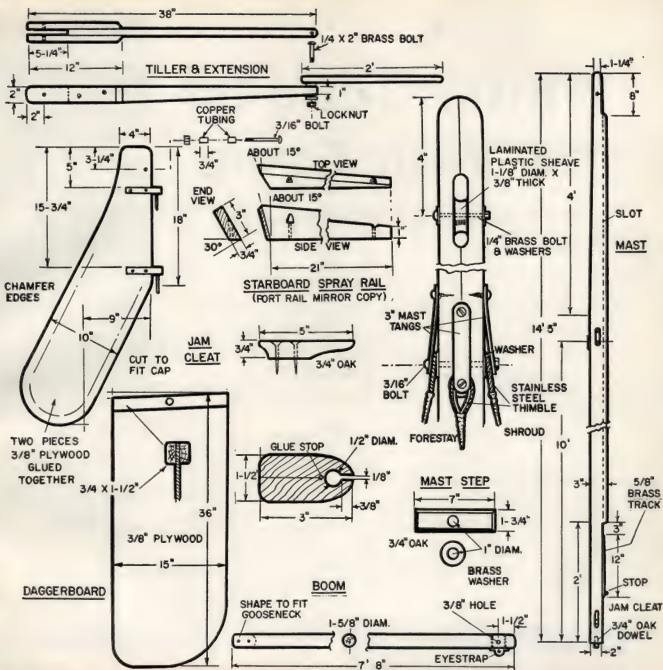
CUT,
FOLD,
TAPE

TEACUP SAILBOAT



SAIL EMBLEM





SPARS, DAGGERBOARD AND RUDDER

frames are beveled so that they will make flat contact with plywood planking. Since there are no compound curves, fairing can be easily checked by running a straight piece of wood along the chine and the keel, as well as along the chine and clamp.

If you're good at handling a belt sander, it will do a fast job of fairing for you. A slip can be disastrous, however, so don't choose this job to learn how to use the tool. A sharp jack plane and a wood rasp are slower, but much safer.

Bilge battens should now be set in place. Battens are placed approximately 9 in. from the keel at the transom and led forward so that they will end midway be-

tween the keel and chines at the stem.

Cut limber holes (small triangular notches) in No. 2 and No. 3 frames, so that water can run to the low part of the bilge, where it can be more easily bailed or pumped.

Now is a good time to set the transom and stem knees, while the frame is open and easily accessible. Cut a cardboard pattern and use this to cut knees from 2-in. fir lumber. Use a plane or belt sander to get an exact fit, and fasten knees in place with glue and screws.

Center the 1 3/4-in. lower keel on the main keel, and glue and screwfasten in place, being careful not to locate screws

(Please turn to page 202)

Winter Tune-up for Your Cycle

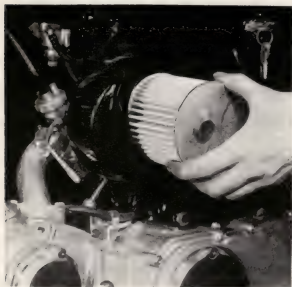
How to Keep Your Lightweight Leaping

Part I

If you're like most motorcyclists—"cooling it" during these frosty days—now's your chance to turn the weather to good advantage by giving your bike a complete tuneup so you'll have a machine that's rarin' to go when the warm weather rolls around again

BY MORTON J. SCHULTZ

This is the first of a two-part series on motorcycle maintenance. Watch for next month's article which will describe tuneup and maintenance on servicing the heavier, standard motorcycles.



MOST AIR-CLEANER UNITS on motorcycles use a paper element, as the one above. Remove unit, tap it to shake off loose dirt, then blow clean with air hose

NOW IS THE TIME, during the current wintry weekends, to give your motorcycle a leisurely, careful and thorough tuneup. And careful it must be, since cycle work, though less complicated, is more critical than car servicing.

Before starting to work, break out your owner's manual. It describes procedures and contains specifications. We're not going to parrot this book. Instead, this article will stress those services which are the most important, and some which aren't in the manual.

Wheels and tires. Riding a motorcycle with unsafe rubber can be suicide. Give both tires a close inspection. If they are worn or show any breaks, replace 'em.

Consider switching the tires—putting the back one on the front wheel and vice versa. A tire kept in continuous service—on the front wheel especially—will begin to wear irregularly and start to peak. This will affect your ability to handle the bike.

Test for loose spokes by striking each spoke individually with a wrench. If they're tight, they'll "ping." A dull response means the spoke is loose. Tighten loose spokes with a spoke nipple torque wrench.

Replace any broken spokes. To do this you must deflate the tire and pull it off the rim in the area of the bad spoke.

Finally, always make sure both tires are





inflated to the recommended air pressure.

Carburetor. The fuel setup of lightweight motorcycles is quite simple. They have no mass of fuel lines—just a length of hose leading from the gas tank to an uncomplicated carburetor. There's no fuel pump either; gas flows to the carburetor by gravity.

However, a cycle carburetor is sensitive and should be checked, cleaned and adjusted at least as often as an auto carb. If one little passage gets plugged, gas stops feeding to the engine cylinder.

Whether you have a four-stroke engine which feeds on raw gas, or a two-stroker which runs on a mixture of gas and oil, servicing is as follows:

- Clean the air cleaner as outlined in the manual. Many mechanical problems can be traced to a plugged-up cleaner which has thrown the meticulously balanced fuel/air ratio out of whack. The rich fuel mixture that results can lead to loss of power, overheating and high fuel consumption.

- Check the fuel strainer. The strainer cleans dirt from the fuel before it enters the carburetor. It's usually located where the fuel line connects into the carburetor bowl. If it gets blocked, fuel is blocked.

To remove the strainer, shut off the fuel supply and unhook the fuel line. Then clean the strainer in gasoline.

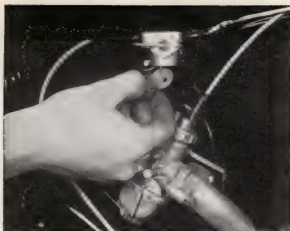
- Test the functioning of the carburetor idle by letting the engine warm to operating temperature. If the engine races or rough-idles, turn the idle-speed stop screw in or out. If the carburetor isn't dirt-clogged, the idle will smooth out. If the carb is blocked, disassemble and clean it.

This is easily done. In the case of a common four-stroke engine of the type shown in the accompanying photographs, drop the bowl and remove the two jets with a screwdriver. Wash the parts in carburetor cleaner and blow them clean with air pressure. While you're at it, remove the fuel line and clean that too. It might be clogged with residue (varnish).

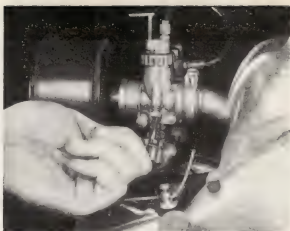
Ignition. Your motorcycle's ignition system has the one job of generating a spark powerful enough to jump the sparkplug electrode gap.

To check if it's doing its job, remove the sparkplug, reattach the plug wire, ground the plug by holding it across the head, then crank the engine. If you see a spark jump the gap, all's well. If no spark, check out the ignition system until you find the trouble.

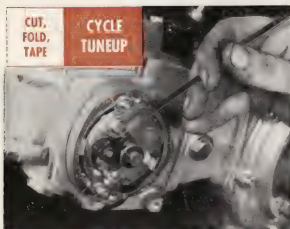
Even if you get a nice spark, you should time the ignition to the specs given in the manual. You'll need a timing light for this job. If you don't have one, let your cycle shop time the ignition. Remember that



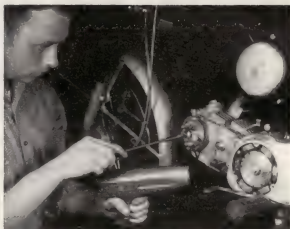
CLEAN THE METAL FUEL STRAINER in gasoline. This one is located in gas shutoff on fuel-tank side of fuel line. Other types are located at carburetor inlet



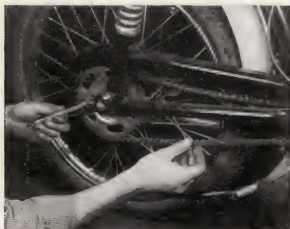
SMOOTH OUT ROUGH-IDLE or racing of the engine by turning idle-speed stop screw. Turn screw to right for a richer mixture; to left for a leaner mixture



ADJUSTING BREAKER POINTS (static timing) is done with feeler gauge to specs in your owner's manual. Final adjustment is then made with a timing light



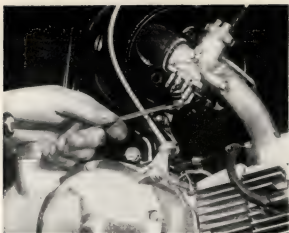
USE A TIMING LIGHT when making fine adjustment of the ignition timing. A timing light measures ignition timing and timing at the end of spark advance



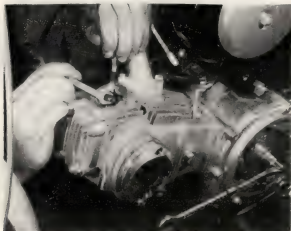
TIGHTEN OR LOOSEN DRIVE CHAIN by turning adjusting nut on rear fork. A slack chain will slap; if too taut, power transmission to rear wheel is hindered



BRAKE ADJUSTMENTS are made by activating brake lever on handlebar and brake pedal while turning brake adjusting nuts on the front and rear wheels



DIRT IN THE CARBURETOR can shut off fuel to the engine. Clean the carb in gasoline after disassembling it by unscrewing the carburetor jets as shown



FEELER GAUGE IS USED to adjust fuel intake valve as shown, while piston (lower right) is held at top dead center. Exhaust (below head) is adjusted too



WHEELS SHOULD BE PULLED every 5,000 to 10,000 miles and the brake linings inspected. If they are glazed, clean 'em with emery cloth or armature paper

a retarded spark will reduce power output of your engine, and an advanced spark can severely damage the engine.

Check the condition of the breaker points. If they're badly burned or pitted, replace them—and the condenser. Also, adjust the points to specifications.

Check all wiring for breaks and fraying and replace any bad wires.

Now turn your attention back to the sparkplug. If the electrode end is worn or damaged, or the porcelain cracked or broken, or if the gap is too wide, replace the plug.

Keep in mind that sparkplugs of motor-cycles wear faster than those in a car, and that those of two-stroke engines wear faster than the plugs of four-strokers.

The sparkplug in a two-stroke engine can tip you off to one of the most critical of all conditions for these engines: the gas/oil mixture ratio. If the plug end has a layer of carbon over it, check the manufacturer's recommendations concerning this mixture. A two-stroke engine that is constantly run with an improper mixture will burn up sooner or later.

Battery. If your bike uses a battery—and all four-stroke engines do—check it out as follows:

The winter lay-up may have caused the battery to run down. If so, recharge it with a trickle charger. Note: Never use a charger having an ampere-hour rating greater than that of the battery; it *could* cause the battery to explode! Match the ampere-hour rating of the battery (it appears on the case) to the ampere-hour rating of the charger. Cycle batteries are rated from 2 to 15 ampere hours.

All cycle batteries are equipped with a vent tube which permits battery gases to escape. This tube must be kept clear. To be sure it is, remove it and blow it out with compressed air.

If the battery is equipped with screw-on connectors, remove the terminals from the posts and clean corrosion off both elements. Apply a thin coating of Vaseline to posts and terminals, then reconnect.

Check the battery electrolyte level. If the battery needs water, use only distilled water.

Valves. Adjust the valves at least once every 1,500 miles. The manual will tell you how to do it for your particular bike. In general, the piston is brought to top dead center, then valve adjustments are made with a feeler gauge to the required specs. This should be done while the engine is cold.

Two-stroke cycle engines have exhaust ports instead of an exhaust valve. Examine these ports to make sure they are

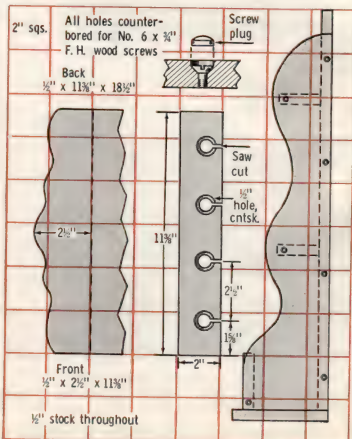
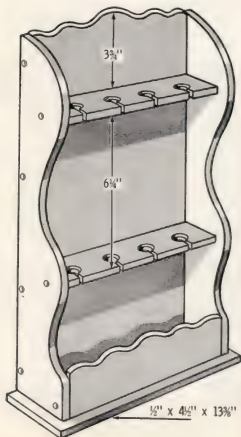
(Please turn to page 221)

Spoon Rack and Planter

SETTING OFF the soft glow of antique silver against a mellow fruitwood finish, this tasteful display rack was designed specifically for exhibiting a collection of antique and commemorative spoons. Slots are provided for eight spoons. The bottom shelf is deep enough to hold a shallow planter tray, but might also be used to show off two or three fine china cups.

With butt joints used throughout, cutting and assembling the rack is a simple operation. Be sure to counterbore all screw holes and conceal the screws with wood plugs. After staining, give the rack a couple of coats of low-gloss varnish to resemble a hand-rubbed finish.

If you would prefer to work from a full-size pattern rather than enlarging the cutting drawings on the grid below, send 50 cents to Steve Ellingson, Popular Mechanics Pattern Dept., Box 2383, Van Nuys, Calif. 91409, and request pattern No. 112.



TIPS

FROM READERS

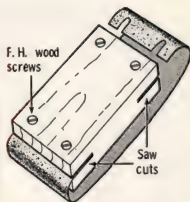
$\frac{3}{16}$ " to $\frac{1}{2}$ " ground off flush



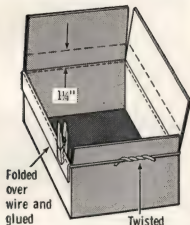
SMALL SOCKETS used on thin nuts and thin-head bolts have a tendency to wear out at the lip. To renew such a worn socket, grind $\frac{1}{8}$ in. to $\frac{3}{16}$ in. off end of socket



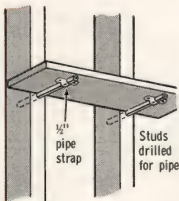
CHOOSING the right bit to drill a hole for the right top is no problem if you use the nut of the bolt that's to fit hole. Simply pick a bit that just passes through nut



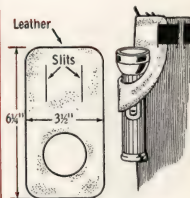
PALM-SIZE sanding block for small jobs can be made by cutting a $3\frac{1}{2}$ -in. piece of 1x2 stock, sawing slits in the ends and using No. 6 screws to clamp the sandpaper



TO MAKE a tough scrap box from a cardboard carton, trim the flaps to a width of $1\frac{1}{4}$ in. and fit a length of heavy wire around top, then glue flaps down over wire



HEAVY-DUTY shelves for your garage needn't be difficult. Bore holes in the studs for pieces of $\frac{1}{2}$ -in. pipe and fasten shelves to them with regular pipe straps



HOLSTER for carrying a flashlight hangs from your belt, saves wear and tear on your pockets. To make it, cut a piece of leather or flexible belting to dimensions

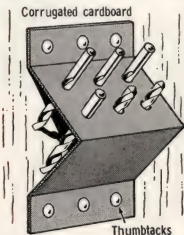


Hole drilled in edge for Peg-Board hooks

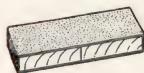


Baby food jar

TO HANG a rack of baby-food jars on a perforated hardboard panel, drill holes in a length of 1 x 2 slightly undersize for the angled fixture hooks and mount as shown



IMPROVISED drill rack can be made from a piece of cardboard by folding down the middle, bending short flanges, punching holes above fold and tacking it to wall



IF YOU run out of sheet sandpaper of desired grit, you can finish job with a spare sanding belt. Just slip it over pair of blocks hinged with tape to fit inside belt

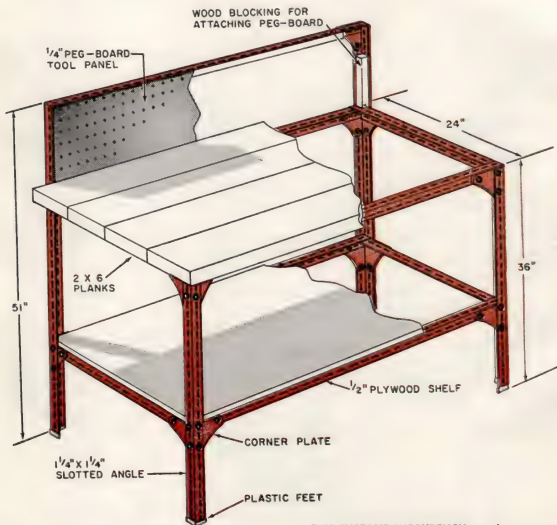
Build Anything with



HERE'S A FUN MATERIAL which will remind you of a construction toy you may have played with as a boy. Called Dexion, it's slotted steel angle which goes together with nuts and bolts like its toy counterpart and lets you build practically anything with the greatest of ease—and in short order. You simply cut the material to the lengths you want and then bolt them together with the special corner plates that come in the same package. No drilling is necessary, a hacksaw and wrench are the only tools you need—the pieces are even painted with a baked enamel finish.

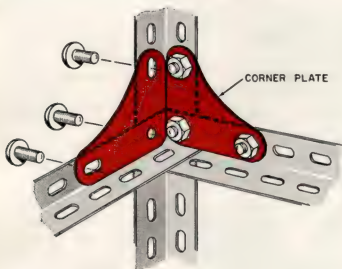
What can you make with it?—you name it. It's great for the framework of lightweight game and hobby tables, tool stands and workbenches. Mere working with it will suggest many other applications.

Where can you buy it?—at your local hardware store and lumberyard. It's packaged in two sizes, light duty which measures 1 x 1 in., and standard duty which measures 1½ x 1½ in. You get ten 5-ft. lengths of light duty angle for \$10.50, and eight 6 ft.-6 in. lengths of standard duty for \$12.75. Both bundles come complete with 75 nuts and bolts and 20 corner plates.

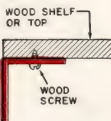
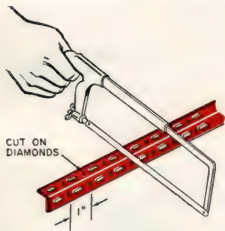


THIS INSTANT WORKBENCH can be put together in one evening from one package of material. Add a plank top, a plywood shelf and a Peg-Board tool panel to the slotted angle framework and you're in business. Length can vary; this one measures 48 in.

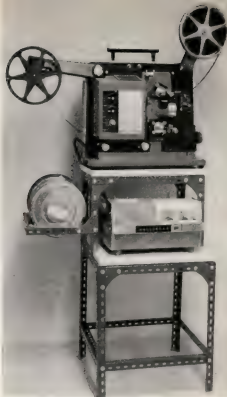
Slotted Angle



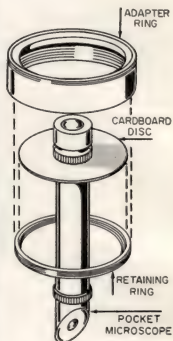
SLOTS IN METAL ANGLE make alignment of bolt holes in corner plates quick and easy when joining



NO RULER IS NEEDED to measure the slotted angle—
"inch marks" are built-in to show you where to saw



Fun with a Nearsighted



HERE IS HOW cardboard disc, sandwiched between adapter and retaining rings, is used to attach microscope to camera

PHOTO HINTS



THERE'S NO NEED to paw through a tangle of flash cords in your gadget bag to find the one you want. Just cut a piece of cardboard to fit in the bag on top of the other equipment, then staple $\frac{1}{2}$ -in. elastic to the cardboard to form a series of loops



THE THREE-PART BOXES used by most manufacturers of sheet film tend to be difficult to open when working in darkness. An easy solution is to stick a tab of tape to the bottom of the box. This will act as a handle and will fold flat when the box is covered

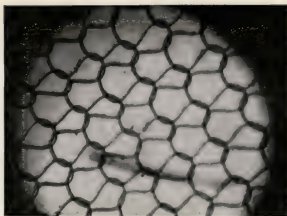
Camera

THERE COMES A FRUSTRATING TIME in the life of nearly every photographer when he feels that there just aren't any new subjects for his camera. I know—it happened to me not long ago. But then I decided to try my hand at microphotography, and now I'm convinced that I'll never run out of things to photograph. Even such humdrum items as salt and laundry detergent become exciting subjects when you move in for a close-up with camera and microscope.

A laboratory setup for taking microphotographs can run into thousands of dollars. But that's for the pro. My entire cash outlay came to only \$2.70, for a 50x microscope called the Micro-Pen. I ordered mine from the Edmund Scientific Co., Barrington, N.J. There was no need to buy a special camera—my 35mm single lens reflex filled the bill perfectly.

The drawing shows how I connected the 'scope to the camera. A hole cut in a cardboard disc provided a snug fit for the barrel of the microscope. An adapter ring and retaining ring are used to hold the disc in front of the camera lens. The rings are standard items in any photo shop.

Through trial and error I've found that a 7-watt frosted night-light bulb positioned an inch or so below the microscope objective supplies sufficient illumination for



WIFE'S NYLON STOCKING was subject of this shot

focusing and photographing at reasonable speeds. It's not possible to give any definite recommendations about exposure time; that is something you'll have to determine by experimentation. But as a starting point you may want to consider shooting between 1/25 and 1/100 sec. at f/3.5 on 400 ASA film.

If no microscope slides are available, slide cover glasses of the type used for mounting color transparencies may be used. Your kitchen cabinets and medicine chest should yield an abundant supply of interesting photographic subjects.

Before making the photograph, be sure to place the camera on a sturdy tripod. If you don't, magnification of camera movement may ruin the picture. If your camera has a built-in self timer, use it to trip the shutter. Otherwise, a cable release will do the job.—*Rene Zentner*



KEEPING A CONTINUOUS CHECK on the temperature of the circulating water bath around your film tank and chemical bottles is no problem. Punch a hole in a faucet hose attachment and insert the sensing stem of your darkroom thermometer as shown



ON MANY EXPOSURE METERS an external zero adjustment screw is provided. The screw is usually very easy to turn and may accidentally be moved when carrying, causing an incorrect reading. To prevent this, secure screw with small piece of adhesive tape

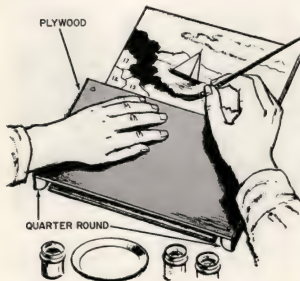
SOLVING HOME PROBLEMS



ICE-CREAM STICK dipped in a can of paint and fastened to it with a heavy rubber band will show you the exact color of the paint when dry. Locate the rubber band to indicate the level of paint inside can



FACIAL TISSUE BOX placed near the phone makes an ideal no-knock cradle for the receiver, sparing the party on the other end of the line from that loud noise when the receiver is placed on a hard surface



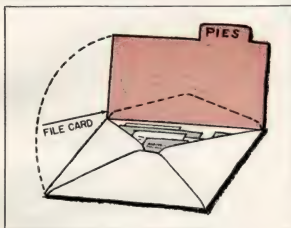
HANDY ACCESSORY for paint-by-numbers hobbyists is a hand "bridge" of plywood about 3 in. wider than the picture. It lets you work comfortably on any part of the picture without smearing other areas



BOILING CLOTHESPINS in a strong salt solution will make them less apt to split and prevent them from freezing to clothes. A bit of salt dissolves on the wet clothes and lowers the freezing point of the water



FIRST RULE OF SOLDERING is to brighten the surface of the metal. For those rare home soldering jobs, the fine wire bristles of a suede shoe brush do good job where you lack a regular scratch brush



FILE POCKET for holding recipes clipped from magazines and newspapers can be made by sticking the gummed flap of an envelope to a card file. Folding the envelope over for filing automatically seals it

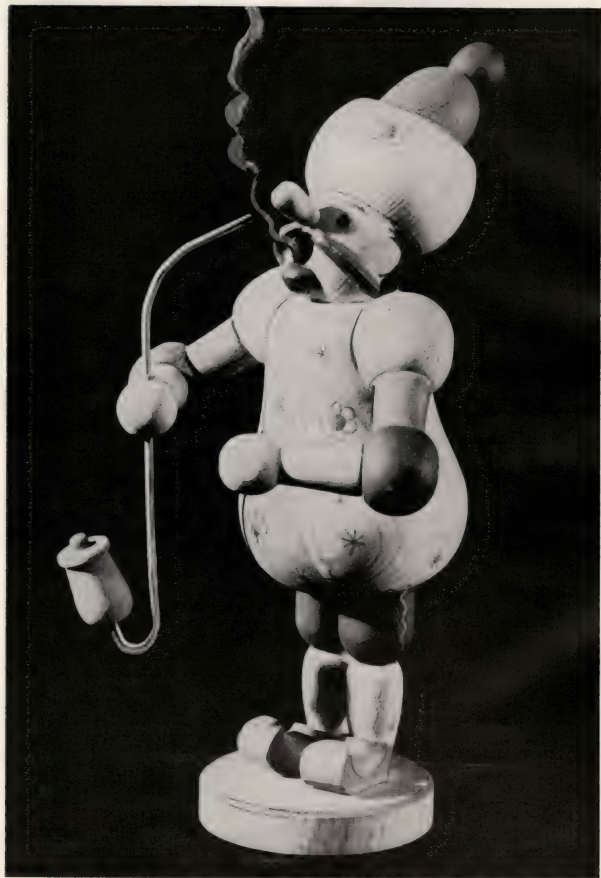


CALIBRATING a spring-type postal scale is easy if you have a standard weight. To make one, take a plastic pill bottle and some lead shot to the post office and have the clerk make up a 3-oz. weight



YOU CAN MAKE a replacement for the wooden handle of a frying pan if it's the type held by a threaded rod. Just bore a hole lengthwise through a wooden chisel handle and shape small end to fit socket on pan

Lathe Fun from

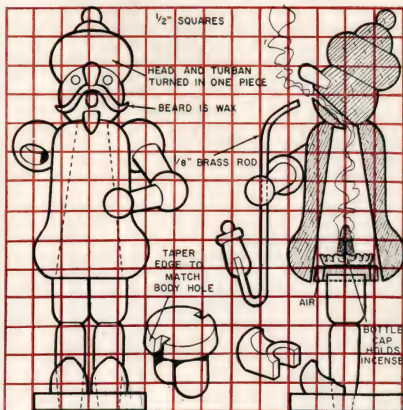


Alpine Novelties

BY HI SIBLEY

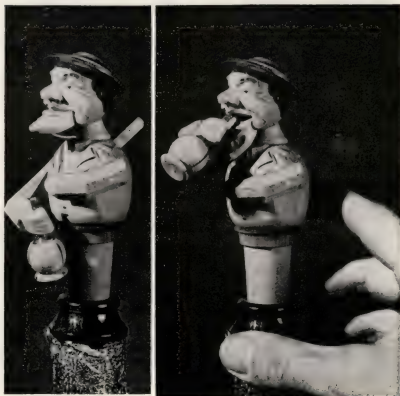
Smoking Caliph

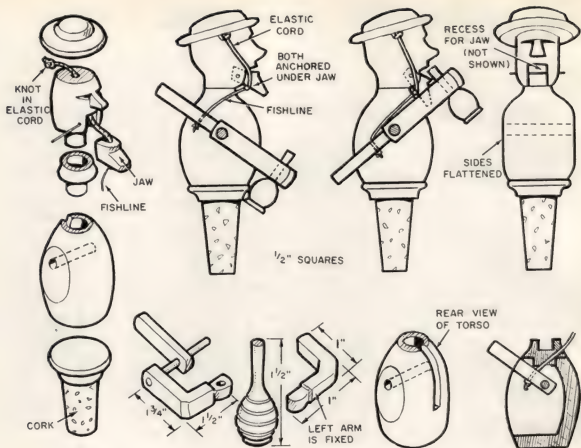
NO NEED TO HOP a jet to the Alps if you hanker for some of those colorful "cartoons in wood" that German carvers are famous for. And no need, either, to gag at the fancy price-tags Ye Olde Gift Shoppe hangs on such pieces. You can make 'em yourself! Never tried wood-carving? Doesn't matter—the hand knifework on the three "animated" novelties detailed on these four pages is kept to a minimum. Most of the shaping can be done in no time on your lathe. The incense-puffing Caliph at left is a good starting project. Only the turned-up-toes sandals are hand-carved.



Otto the Drunk

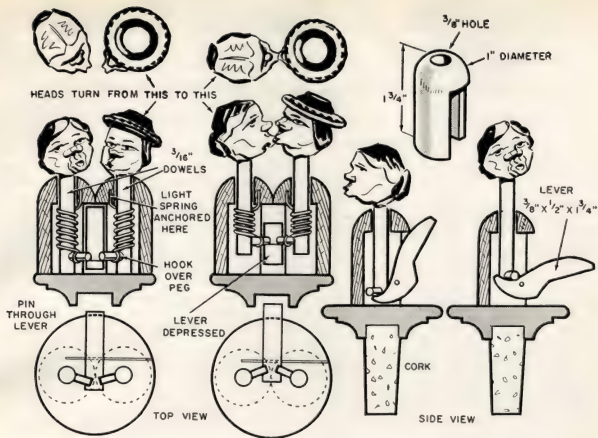
MAKE IT FUNCTIONAL and you've added a lot to the appeal of a carved cartoon. The Caliph is an incense-holder; the other novelties (detailed on the next two pages) are bottle-stoppers. That's an ironical job for Uncle Otto, here—his own bottle is *never* corked. Press on the back lever and Otto's drinkin' arm swings up as his mouth opens wide in thirsty anticipation. After a swig, the arm drops and the mouth snaps shut. The torso and hat are lathe-turned. To avoid carving the face, you can turn the head, too, and *paint* the features on. The jaw is controlled by cords—an elastic one through the head shuts it.



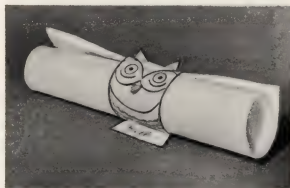
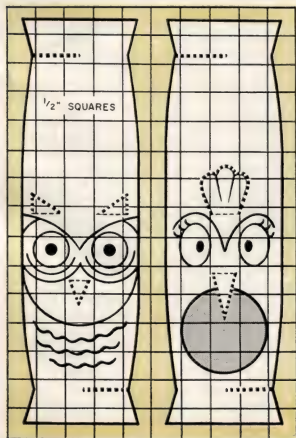


Fritz und Frieda Bottle Stopper

ANY MISTLETOE left over from Christmas? It sharpens the gag if you hold a sprig over this perpetually-puckered pair before you press their back lever. They seem to be whistling a duet up till then, but—zow!—as they turn toward one another their dowel necks stretch and they exchange a good Chermom smack you can almost hear! Light-compression coil springs in each hollow body break up the clinch when you release the lever. Turn both bodies (the decorations are carved in later), then cut away a section of each so they can be joined with a common hollow and lever slot, as seen in the section views, next page. ★★★



PARTY TABLE MASCOTS



LADY GUESTS will be all a-twitter, and the men will get quite a hoot out of these whimsical party favors, which double as place-cards and napkin rings. Enlarge the patterns shown, tape the enlargement to a light-box (or a sunlit window) and place sketching paper over it so you can trace through. Using soft color pencils, outline the owl in brown, the ladybird in blue, and color both bills orange. Cut out, loop each strip around to notch into itself, slip a paper napkin in and watch your dinner party take wing.—*Roberta Fairall*

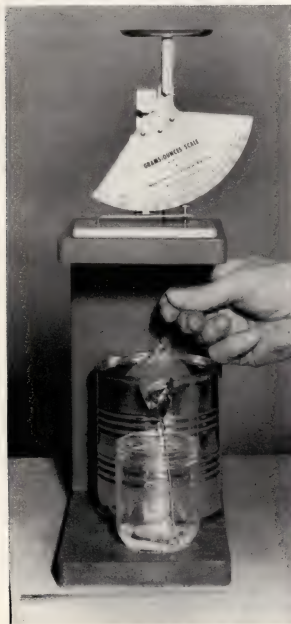
Specifics of Specific Gravity

**This simple yet accurate experiment proves
Archimedes' principle of specific gravity**

By Harold P. Strand

Specific Gravity: the ratio of the mass (density) of a body to the mass of an equal volume of water.

HERE'S A CLASSIC EXPERIMENT your youngster can first conduct at home, then perform for his science class at school. Properly conducted, it verifies the theory of specific gravity as first set forth by Archimedes some 2,000 years ago.



The only scientific equipment required is an inexpensive gram-ounce balance.* A simple wooden stand (see drawing) is then constructed to support the balance, water container and catch jar. The water container can be made from a tin can with a soldered-on pouring spout, as shown. Any test object can be used, so long as it can be immersed in the water container. A small aluminum casting was used here.

Place the balance on the top platform of the support, then tape a short length of small-diameter steel rod to one of its pan supports so the rod extends down through a hole drilled in the platform. The test object will be suspended in the water from a hook bent on the end of this rod. Adjust the balance so the indicator points to 0 lbs.

Now weigh the test object, then the catch jar, on the balance. Place the jar under the spout of the tin can which is filled to the brim with water. Tie a piece of fine thread to the object with a loop 'round the other end, then hang it from the rod's hook with the object suspended—immersed—in the water container. Next weigh the catch jar *with* the water that overflowed into it.

The specific gravity of the object is found by subtracting the original weight of the empty jar from the weight it now has *with* the displaced water. The *difference* between these two weights is the specific gravity of the object. Or:

$$\text{specific gravity} = \frac{\text{loss of weight in water}}{\text{weight of object in air}}$$

Our aluminum casting showed a weight loss in water of 51 grams. Using the above formula, 135 grams (its weight in air) divided by 51 grams (its loss of weight in water) gives it a specific gravity of 2.65 grams—pretty close to the true specific gravity of 2.7 grams for aluminum.

The volume of an object is the same as the water it displaces. Thus we apply the relation of 1 gram (weight of 1 cc of water) to the loss of weight of the object; or, 51 grams $\times 1 = 51$ cc—its volume.

These general principles apply also to buoyant objects. However, the addition of a lead sinker to pull the object under water is required. ★★★

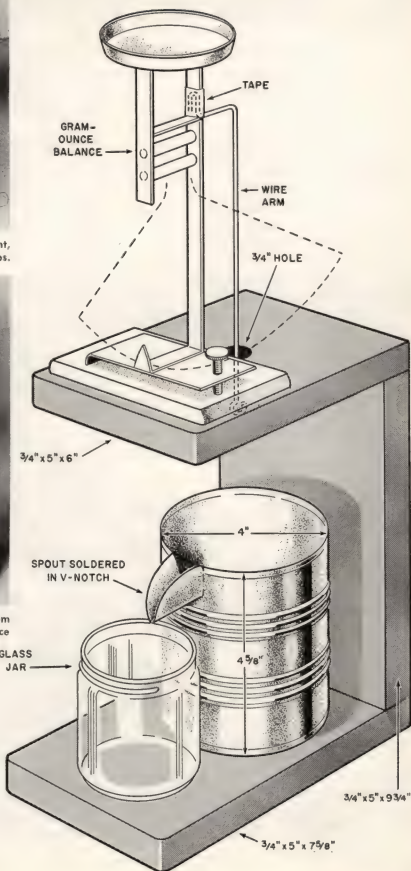
*This balance may be ordered from Edmund Scientific Co., Barrington, New Jersey, for \$6.65 p.p.d.



BEFORE CONDUCTING experiment, adjust balance to read zero lbs.



TEST OBJECT is suspended from wire taped to pan of the balance



You Can Find **GOLD** in Them Thar Hills with This Gas-Driven Drywasher

You'll "strike it rich" in half the time with this vibrating rig which lets you sift for gold without water

By John E. LaVallee

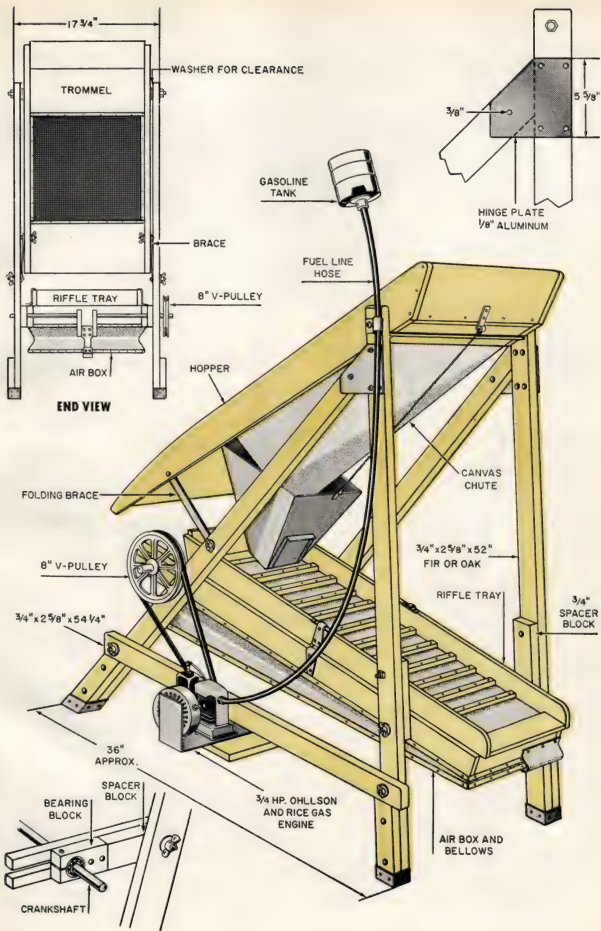
ATTENTION, YOU GOLD DIGGERS!

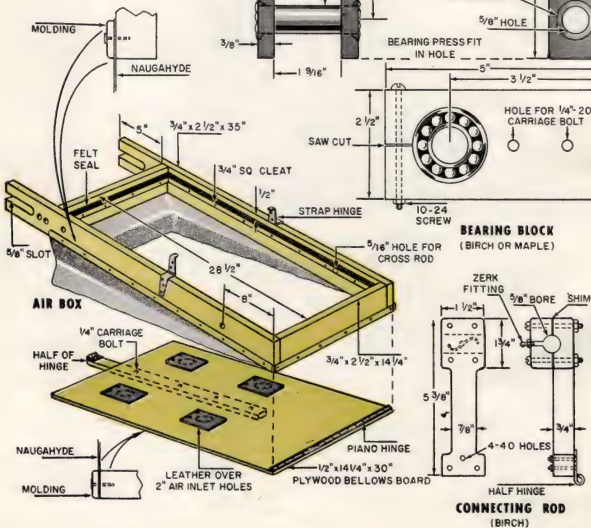
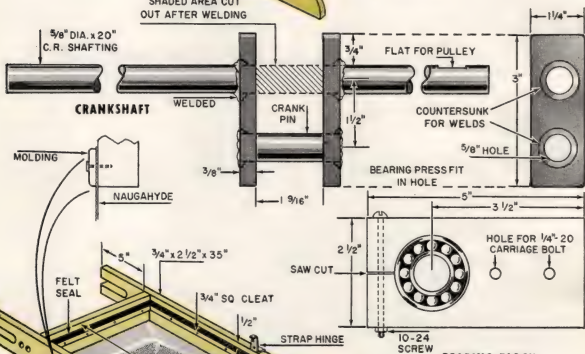
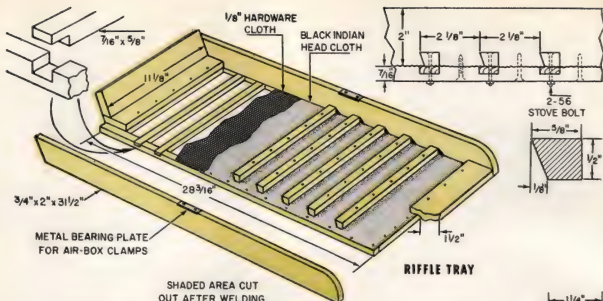
If you were one of the thousands who sent 5 cents for a list of 220 U.S. counties where placer gold can be found (*Glittering Gold Rush Vacation*, page 102, June '65 PM), chances are you're more than mildly interested in the new family sport of finding the glittering crumbs the '49ers overlooked.

The fun of panning for gold becomes twice as exciting (and profitable) when you can work regions which are not swarming with other "claim jumpers." In his search for gold, the old-timer prospector stuck pretty much to streams and riverbeds and passed up desert placers because of a lack of water. The same holds true in the current gold rush of '66. But



IN ARID AREAS the sifting operation can kick up a cloud of dust, so to protect the engine, I added a heavy-duty air cleaner high above trommel. It's optional, as is the engine, since drywasher can be hand-cranked





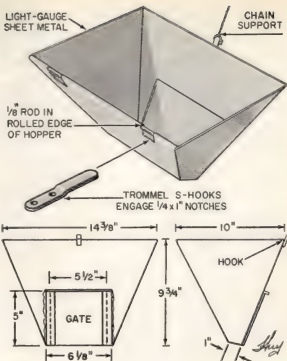
with this build-it-yourself drywasher, the modern-day sourdough and his vacationing family are able to work off-stream diggin's and old mine dumps with as little as a tub of water, since only the screened concentrate needs to be washed.

The drywasher is nothing more than a motorized sifter which jiggles vigorously to separate the gold from the sand and gravel you shovel into it. In actual operation, the earth being tested is shoveled onto a slanting screen-covered tray called a trommel, where it sifts through onto a canvas chute and flows into a hopper.

When the hopper and chute are full right up to the trommel, the engine is started and the gate in the hopper is opened about $\frac{3}{4}$ in. The material in the hopper flows onto an inclined tray which is fitted with cross cleats called riffles. Rapid air pulsations, produced by a bellows mounted below the tray and operated by a crankshaft, bounce the screenings 2 to 3 in. above the cloth bottom of the tray. This jiggling action causes the heavier part of the material (the gold) to settle to the bottom of the tray and collect behind the beveled riffles, while the lighter portion flows over the cleats and off onto the ground as waste.

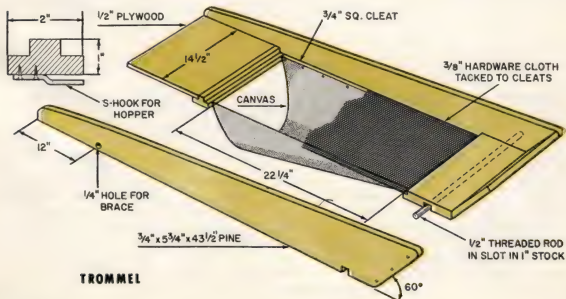
When the hopper is empty, the engine is shut off the riffle tray is lifted from the air box on which it sits. The concentrate held by the riffles is carefully poured into a pan of water and washed in the usual way to check the presence of gold in the concentrate. The process is repeated over and over—until you have all the gold you can carry.

Basically, the drywasher consists of four main parts: the trommel, riffle tray, air



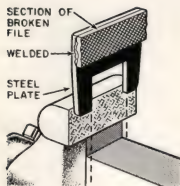
box and hopper—each being detailed individually in the drawings. Standing on A-frame legs fitted with wingnuts, the rig can be quickly dismantled for carting to and from the site. The cloth used in the bottom of the riffle tray must be sufficiently porous to allow air from the bellows to pass through freely.

Chances are you won't get rich from this fascinating hobby, but you might be interested to know that my "pardner," Clayton Mendham, recovered \$1700 worth of gold last summer with a drywasher similar to mine—and that's not hay. Good luck and good diggin'! ★ ★ ★



TIPS

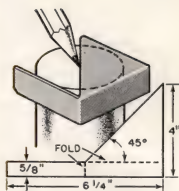
FROM READERS



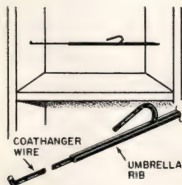
RENEW THE GRIP of worn-smooth vise jaws with two lengths cut from coarse-tooth file. Weld 'em to straddle plates, then slip units over sliding beam of vise



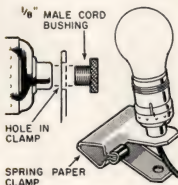
PROTECT EXPOSED bulbs in barn, shop or spray booth with "bottle jackets" which fit to twist-on caps installed between screw-shell ring and fixture



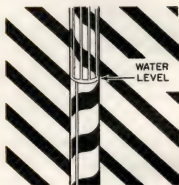
SELF-CENTERING center-finder locates the bull's-eye of all sizes of dowel stock. Make it any size from sheet metal—cut, bend, then use as shown above



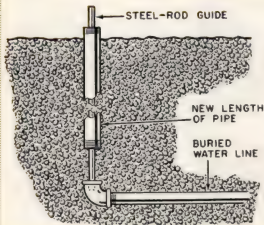
"BLIND" INSIDE MEASUREMENTS are easy with this gadget—a bit of umbrella rib in channel, in which slides a length of coat-hanger wire bent as shown



WORK LIGHT on extension cord uses a big spring paper clamp as a base. Light can also be clamped where you want it, or hung from the wall on a nail



SIMPLIFY READING boiler water gauge by backing it with a card bearing diagonal black lines. Refraction makes water line appear horizontal for easy reading



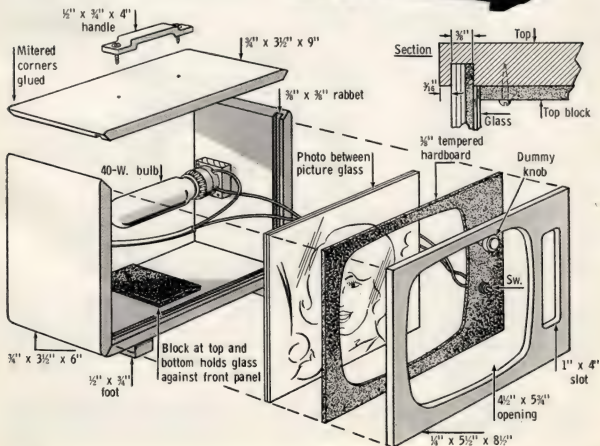
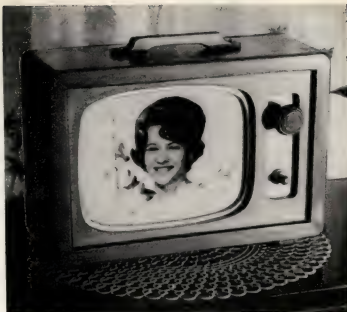
"Guide Rod" Saves Digging

How to replace a vertical buried water pipe which has frozen and burst—without digging? O.E. Hadwiger of Pueblo, Colo., solved this poser as follows: He removed the hydrant faucet, then thawed the pipe with hot water from his basement hose. He then dropped a 6-foot length of steel rod down the burst pipe till it bottomed in the elbow. Unscrewing the pipe and sliding it out over the rod, he simply slid a new length of pipe down the rod, which guided it straight to the buried elbow where he screwed it in place.

TV Lamp

POSING as a portable TV set itself, this novelty lamp is a natural for the top of your TV set, but it also makes a cute night light for a child's bedroom. Its "picture tube" displays a picture both day and night since the bulb shines through a photo sandwiched between the front glass. The back can be closed with perforated hardboard or left open as you see fit. If you decide to cover the back of the cabinet, be sure that you don't use glue when installing the back panel, since you'll have to remove this panel eventually in order to replace the light bulb when it burns out.

The front panel is rabbeted into the cabinet. When cutting the openings in the front panel and the hardboard panel underneath, make the picture cutout in the hardboard panel slightly smaller than in the front one. Then give the hardboard panel a metallic gold finish and it will become a rim around the picture tube, plus a "brass" background for the controls.—Harold Jackson



Carving Signs with Router

By Ray Shoberg

ALL OF US have had some occasion to hand-letter a sign, but most of us are shy about it, except in an emergency. A sign is such a public thing, deliberately calling attention to itself—and to any lack of skill on the part of its creator. Yet we couldn't live without signs—and it's ex-

pensive and cumbersome to seek professional help each time we need one.

Here, at last, is a foolproof technique for making truly professional signs—and you never touch a lettering brush. You don't even have to lay out the letters: it's done for you, automatically, by an in-



Templates

genious set of router templates held in a simple frame. Five of them, used in various combinations, let you rout every letter in the alphabet—and all the numbers, too. Yet these templates are easy to make, using the Project-a-Plans at the right.

And the signs you end up with are



DOOR STAYS IN PLACE for routing, saving removal or less-attractive separate sign board. Since veneer on flush doors is thin, make very shallow cut



PICTURE OUTLINES (above and at left) require special templates, of course, but all lettering shown here was done with five templates stacked at right



See reverse side



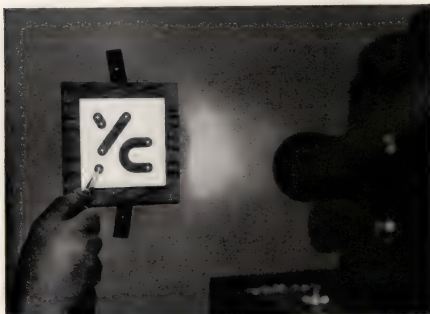
TEMPLATE TIP to fit your router must be purchased and attached to base with two screws. The tip is what guides the cutter neatly along template slots

for clip-out

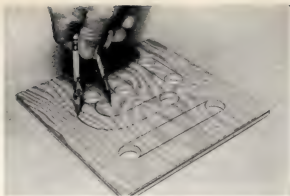
THESE COMBINATIONS produce well-proportioned letters and numerals. Keep this list for reference; following each letter are key numbers of the template slots you need. Slots may have to be used more than once to form the letter.

A—5,11	J—2,4	S—13	1—1
B—1,14	K—1,10,16	T—1,2	2—2,8,13
C—4	L—1,2	U—2,12	3—13
D—1,8	M—1,7	V—5	4—1,11,16
E—1,2,3	N—1,6	W—5	5—2,3,13
F—1,2,3	O—12	X—6	6—4,13
G—4,11,12	P—1,14	Y—2,10	7—2,6
H—1,3	Q—12,17	Z—2,6	8—13
I—1	R—1,10,14	O—12	9—4,13

Project-a-Plans



PROJECT EACH SLIDE directly onto plywood template blank on which sizing square has been drawn and, with awl, punch exact center of every cross



SWING COMPASS from crosses outside slot areas. Other crosses are centers for drilling. Connect compass arcs and edges of holes to complete layout



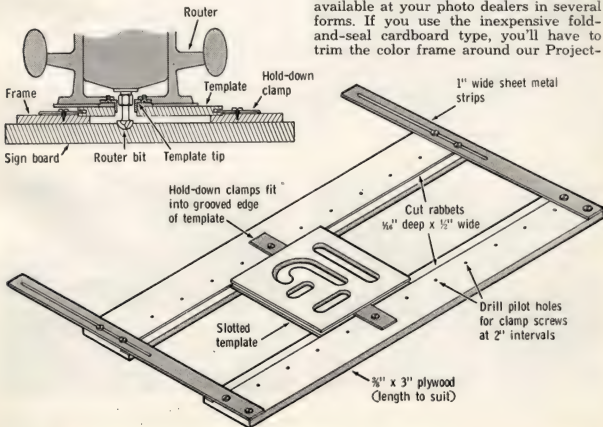
AFTER SAWING all cutouts, insert template tip in each slot and move it from end to end to be sure it will slide without binding—and without excess play

something you'll display with pride. The painted letters are "carved" into the surface, as in signs you've seen in National Parks. One reason this style of sign is so popular in tough maintenance areas is that it lasts forever. Weather can't erase it, and even if the paint wears away, the letters are still readable.

The sketches below show how the system works. An adjustable frame holds the templates while you're routing; it's secured to the face of the work by C-clamps or small brads. The length of the rabbeted rails and the sheet-metal strips can be adapted to the size templates you plan to use. The hold-down clamps are secured

by screws which can be moved to different holes in the rails as the work progresses, to avoid shifting the frame itself. For all the frame assembly, use sheet metal screws with pan heads thin enough to let the router pass over them.

It's not difficult to make accurate templates once you've clipped out the paper patterns and rubbed a little vegetable oil on both front and back to render them transparent. Since the templates must be square (so they can be used in four positions and flipped over for four more) we've designed the Project-a-Plans for use in super-slide mounts, rather than regular 35mm mounts with smaller, rectangular windows. Super-slide mounts are available at your photo dealers in several forms. If you use the inexpensive fold-and-seal cardboard type, you'll have to trim the color frame around our Project-





SPACING ISN'T AUTOMATIC—for best appearance, lay out words first by tracing through templates



SHAPES OTHER THAN LETTERS require only a simple "silhouette" template cut in to plywood or hardboard



AFTER ROUTING, coat all recessed areas with any good exterior enamel, spraying from several angles

a-Plans somewhat so they'll set within the cement seal-stripe on the inside face of the mount. Despite the larger window, these mounts have the same 2x2-in. outer dimension as 35s, so they'll fit any standard projector.

Decide what size letters you want, then cut five identical template squares from plywood, half again as large as the letter height (for example, an 8-in. letter needs a 12-in. square). Letters less than 4 in. high, however, still require a 6-in. square—the minimum size that will support the base of the average router.

Now, mount one of the squares on the wall and aim your projector at it. Move the projector back and forth until the white image exactly covers the square. Be sure the lens axis is perpendicular to the plywood, or distorted templates will result. Once you have the projector set up, don't move it when you're ready for the next square. Instead, mount that square in place of the one already marked and insert a new slide.

While the image is projected on the plywood, mark the exact centers of all the crosses. To distinguish between the marks *within* a slot to be cut and those *outside*, circle the first type and make an x through the others.

When you've laid out all five squares, clamp a scrap board to the back of each to prevent splintering while you drill. Choose a bit to produce a hole that will pass the template router tip you've purchased, and drill through the plywood at each circled spot. Lines drawn tangent to the edge of these holes and joined with arcs scribed from the cross marks complete the layout. (If you happen to need a slot width of 1½ in. for 8-in. letters, or ¾ in. for 4-in. letters—or any other combination in the same proportions—you can

(Please turn to page 214)



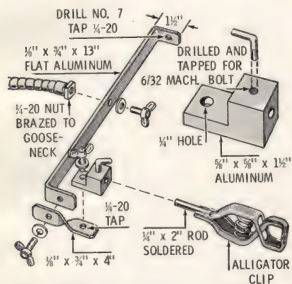
SURPLUS PAINT is sanded off surface, when dry, to leave clean-edged paint areas in all depressions

Hold It, Elmer!

HE'S ALWAYS READY to lend a helping hand and never complains if you burn his fingers. Actually, Elmer is a fully adjustable fixture for holding small work to be soldered, brazed or welded.

Elmer is made from a gooseneck-lamp base, some strap aluminum and three matched pairs of alligator clamps. After removing the shade, socket and wiring from the lamp, weld a $\frac{1}{4}$ -20 nut on the end of the neck, as shown below. The aluminum arms are bent in a vise. To form the short twisted pieces, clamp one end 1 in. deep in the vise, take a 1-in. grip on the other end with a wrench and twist.

Make the thumbscrews by cutting the head off a 1-in. stove bolt, running a wingnut up flush with the cut end and soldering it in place.—*Manly Banister*

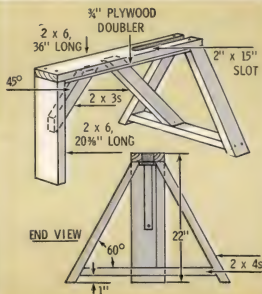


Three-Legged Horse

When you're constructing something simple, such as a sawhorse, it's only natural to stick to a standard, time-honored design. But I had a few ideas of my own for breathing new life into the old horse. First of all, I decided on a tripod base for maximum stability on rough ground or other uneven surfaces. This provided an unexpected fringe benefit—the vertical leg permitted close-in sawing without any interference. I made the top member of the horse from a 2 x 6, slotted to pass my saw blade when I'm ripping small pieces of stock.

To form the slot, I first drilled a 2-in.-diameter hole through the board approximately 15 in. from its end, then ran two saw cuts spaced 2 in. apart into the hole.

—A. Barstad



SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

Ammeter Running Amok?

I have power windows on my 1963 Chrysler Imperial. Every time I operate 'em my ammeter shows a charge. Shouldn't it read discharge?—Mel Rathjen, Portland, Ore.

Electric window motors are wired through the voltage regulator. When a load is put on the battery the current limit relay automatically steps up the amperage output. This will happen when you turn on your radio or heater too—and be glad it does.

Volt-Happy

I'm "going modern" and would like to know how to switch the 6-volt system on my car over to 12 volts. Seems to me most of the new accessories on the market these days are for 12-volt systems—Dave Pendle, Butte, Mont.

Dave, who needs it? You know what this switch-over will involve? You'll have to replace the battery, starter, voltage regulator, generator, condenser in the distributor, ignition coil and all lights. Figure up all the time, labor and money this will cost and you'll probably decide it would be simpler—and maybe cheaper—to go out and buy a car already equipped with a 12-volt system. As for those accessories: in most cases you'll find that a 12-volt accessory is also available for a 6-volt system.

Maligned PCV

Rough-idle has been dogging my '63 Chevrolet Impala. I've had everything tuned to perfection—plugs, points, timing, carburetor—and there aren't any vacuum leaks. Unhooking the positive crankcase ventilation (PCV) system is the only action which smooths out the idle, but I don't like to leave it off. Got any ideas?—Steve Karter, Brooklyn, N.Y.

I'd say your car's rough-idle is due to a too-rich fuel/air mixture. The engine runs like an old smoothie with the PCV disconnected because then more air is permitted to reach the manifold where it mixes with, and even out, the gas mixture. The PCV's okay. Hook it back into the engine, then check out trouble spots that might be throwing the fuel/air mix-

ture out of whack. There's a good chance you'll find the trouble is caused by a high float level or by bad carburetor gaskets, especially where the air horn hooks in.

Descreeching Dodge Brakes

My 1963 Dodge gives out with a loud screech every time I hit the brakes. How can I eliminate this noise?—Ted Morris, Somerset, N.J.

Owners of Chrysler products seem to come up with this complaint more often than others. However, correcting this problem on 1963, '64 and '65 Dodges may not prove too difficult. The trouble may be found in the star-wheel adjuster assembly, specifically the flat washer between the adjuster socket and the face of the star wheel that was put on in production. Often replacing this washer with a wave-type washer will eliminate brake squeals.

This Bird's in a Nosedive

Listen to the troubles I'm having with my '65 Skylark Buick, then please advise (or lend me your crying towel):

1. Gas peddle throbs and pulsates at medium and high speeds.
2. At 10 to 15 mph the car vibrates on the driver's side as if it were strapped in a reducing machine.
3. At medium and high speeds the steering wheel quivers like a tuning fork.

Wheel balance and front-end alignment haven't helped. Can you?—Rocco L. Pignone, Pearl River, N.Y.

Maybe. There's a possibility that the nose angle of the drive shaft is off tilt. This could mean that the line from the power train to the differential is not straight, as it should and must be. I'd suggest you take your Skylark back to the dealer and have him check it for pitch. If you decide to tackle this job yourself, and discover that you'll have to tilt or flatten the nose of the car, do it by raising or lowering the transmission or by changing the pitch of the differential.

Galaxie Au Go-Go

I'm scared—and believe me, I've got a right to be. The accelerator pedal of my '63 Ford Galaxie XL500 with automatic transmission sticks to the floor whenever I press it all the way down. This happens

whether the car's at cruising speed or starting off from a standstill. If you've ever had the experience of passing someone, then letting up on the gas pedal only to have your car continue on its headlong, mad and merry way, you can appreciate why I'm pushing the panic button. No amount of tapping or kicking releases the pedal. The only way I can get it to pop out is by cutting the ignition. As far as I can tell there is no sticking or binding caused by the carpet or grommets between pedal and firewall. So what's up?—William E. Brown, Chattanooga, Tenn.

There are two primary causes for a jammed accelerator on any car. I suggest you check out both of 'em—fast!

First, get those motor mounts inspected. A broken or loose mount can throw the engine and transmission out of line so that the throttle will jam wide open.

Second, the accelerator linkage may not be properly set. The linkage may be riding up over the high-speed cam and sticking there. Get it set correctly.

Wants Her Caddy Spotless

I've got a beautiful '63 Cadillac. The only marks on it—and they're killing me—are soil spots on the vinyl-coated fabric covering the roof. Can I remove them? If so, how?—Paula Freed, Syracuse, N.Y.

Try erasing them first with a natural gum eraser. Spots which can't be erased can usually be washed away with plenty of lukewarm water and a mild detergent powder. Use a clean cloth or soft-bristle brush. If the dirt's really embedded, try rubbing the spot lightly with a moist cloth or sponge sprinkled with one of the "foamy" type cleansers from your kitchen. Then remove all traces of the cleanser by rinsing thoroughly with clear water. Never use volatile cleansers, harsh soaps, bleaching agents or a stiff-bristle brush.

Tale of a Comet

Just can't get the engine of my '62 Comet to idle down. Also, a too-rich fuel mixture is indicated by black smoke which billows out the exhaust. I've tried all the standard cures. What have I overlooked?—Jack Campbell, Dillon, S.C.

The carburetor, maybe. I've received more than one beef of this kind from owners of Comets having both the 144 and the 170 CID engine, and from owners of the Meteor with the 170 CID engine. Both cars seem to have a tendency to develop a blocked-up idle passage in the carburetor. Remove the carb air horn and inspect the passage. If you find some gook plugging it up, clean it out, then replace the air horn and reset idle speed to spec.

Service Tips

• **HEAR A HARD-TO-PINPOINT** scraping noise when you turn the steering wheel of your '64 F-85 Olds? Likely cause is insufficient lubricant on the horn contact brass ring. To repair the trouble it's suggested that the steering wheel, spring and turn-signal canceling cam be removed, and the brass ring and horn contact polished with No. 400 Wetordry sandpaper until smooth. Then clean the brass ring and contact thoroughly before applying lubricate. If the ring doesn't polish up smooth, replace the canceling cam assembly.

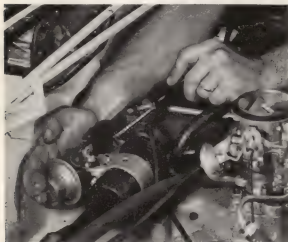
• **FOR OWNERS OF PONTIACS** equipped with the Rochester 2GO carburetor, there's a new pump plunger which has been issued for it (Part No. 7031003), and which should be used if you replace the old one. It can be identified by its plastic tip and by the fact that it **doesn't** have a plunger ball check.

Also, the main metering jet size has been changed on this carburetor where it is used on cars with airconditioning. The new size (Part No. 7008661) is .061 inches instead of .060 inches (the size of the factory-installed jet), and is designed to provide slightly more fuel at idle and low speeds.

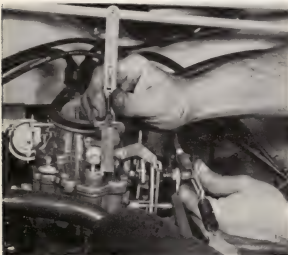
Each month Auto Clinic answers your questions on car repair. For a personal reply, please enclose 25 cents in coin to cover mailing and handling. Address questions to Auto Clinic, Popular Mechanics, 575 Lexington Ave., New York, N.Y. 10022.

You can get more miles per gallon

There are plenty of techniques for getting a better break from your fuel dollar; they range from mechanical adjustments to new driving habits
By Morton J. Schultz



TEST distributor vacuum advance by moving breaker plate to full advance; plug opening with moistened finger. If plate moves when released, unit is faulty



AN OUT-OF-WHACK accelerator pump stroke wastes gas by delivering too much fuel to engine. Measure the stroke, then adjust it according to specifications



POWER ROBBERS inside the engine can be detected by conducting a compression test (shown above) and a vacuum-gauge test. Do both tests every 12,000 miles

“WHAT do you find to be the major causes of excessive fuel consumption in modern cars,” I asked 200 top mechanics in the New York metropolitan area.

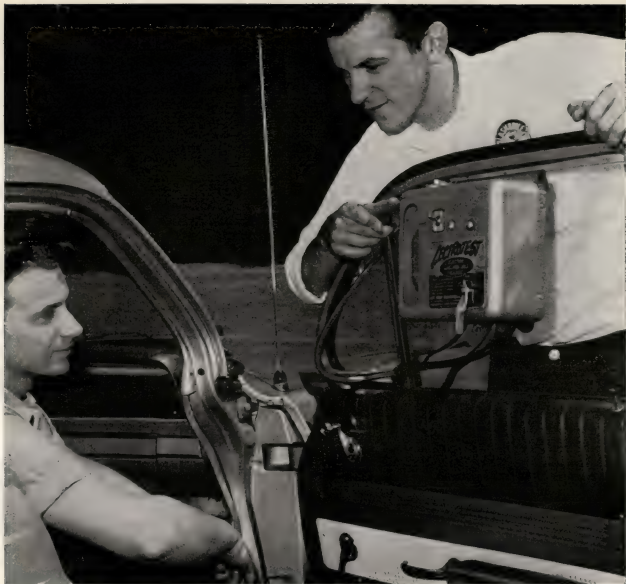
Two answers stand out:

1. The way drivers drive.

2. Mechanical letdowns which rob the engine of power or add to the normal resistances a car must buck.

The experts also pointed out that many drivers whose cars are delivering quite satisfactory mileage are convinced they're driving “gas hogs”—simply because they employ a faulty method of calculating gas consumption.

Unless your car is mechanically perfect, and unless you're an expert driver, there's little doubt you can increase your miles-per-gallon. How much will depend on the



THE ONLY WAY to determine accurately how much gas a car is using is with a gas-per-mile gauge (shown fastened to door of car above). With gauge tapped into fuel system, a test run is made over a planned course

adjustments you make to your car—and the readjustment you make in your own driving habits.

I know. Right away some of you guys will ask, "Is it worth it?"

Well, from a mechanical standpoint I'd say it is; because the same conditions which reduce mileage are also those which rob your car of power and performance and lead to big repair bills.

As for a driver's ability—or willingness—to form new gas-saving driving habits . . . that's another matter. Some people will refuse to cut their highway speed by five miles an hour no matter how much gas they'd save.

Gas-miser tuneup

You must find out how much fuel your car is now using *with you driving*. A mile-

age test conducted by an expert will not show the same results that it will with *you* behind the wheel. However, having an expert drive the car after he observes your driving will give you the chance to get a comparison in mileage between his driving and yours. And he may offer you some good advice for improving your driving habits.

The *only way* to determine accurately how much gas a car is using is with a gas-per-mile gauge connected into the fuel system while driving over a *planned* test course. For those who might scoff at the above statement, let me quote what engineers of a leading national automotive service said recently about odometers as instruments for checking gas mileage:

"An odometer is not an accurate meter for recording engine use because engine

idle time is not recorded. Both speedometer and odometer rely on a cable driven by the transmission.

Thus, if the vehicle is not in motion, neither the speedometer nor the odometer can operate."

Now, here's the bombshell:

"Therefore, in consulting the numbers on the vehicle's odometer it is recommended that about 2000 miles be added to each 12,000 miles showing on the odometer to account for the time the engine has spent idling." (The italics are mine.)

In other words these engineers estimate that in 12,000 miles of driving some 2000 miles' worth of gasoline is wasted by the engine in idling! That's a lot of fuel, Jack.

Of course gas is wasted in other ways as well. There is no way to estimate, for example, how much gas you lose just by evaporation when the car is not used for some time. General engine fatigue as well as particular mechanical failures are important factors too.

Running a mileage test

According to my own rough estimate of the mileage on my car, I was getting an unsatisfactory 13 miles to the gallon. I decided to check this out a little more scientifically.

I took the car to a mechanic buddy of mine who has an accurate gas-per-mile gauge calibrated in tenths of a gallon. We tapped the gauge into the gas line between fuel pump and carburetor and conducted the so-called *bottle test*.

The car was taken on four different runs of equal distance. It was not allowed to sit still and idle except where traffic conditions and red lights forced natural stops. Readings on the corrected odometer were taken before and after each run.

The test course included (1) a drive at highway speed in one direction; (2) a drive over the same highway in the opposite direction (to equalize the effects of any head or tail winds); (3) a drive through a light-traffic urban area; and (4) a drive through a heavy-traffic business district.

Each run was conducted, where possible, at posted speed limits. The resulting readings were then added up and averaged to get the correct gas mileage.

The results of this test showed that my car was getting 18.2 miles per gallon—or 5.2 more miles per gallon than I had estimated—thus proving the unreliability and inaccuracy of those off-the-cuff estimates previously referred to.

This kind of test will cost you \$6 or \$7, but it's worth it—especially if you discover, as I did, that your car's not the gas burner you thought it was.

FUEL SYSTEM GAS ROBBERS

Beware of a fuel system that delivers more gas to an engine than it needs. Listen for faster-than-normal idling; look for black smoke from the exhaust pipe when car is started. Cause may be poor fuel-to-air ratio.

LOOK FOR

- ☐ High fuel-pump pressure
- ☐ Dirty air cleaner
- ☐ Too-rich choke adjustment
- ☐ Improper adjustments of:
 - idle setting
 - fast-idle screw
 - accelerator pump stroke
 - anti-stall dashpot
- ☐ Too-high carburetor float level
- ☐ Internal carburetor damage such as worn jets and faulty power valve
- ☐ Binding in the accelerator linkage



IGNITION SYSTEM GAS ROBBERS

You are not getting the full benefit from your fuel if a weak spark delivered to the cylinders fails to completely burn the gas. Unburned gasoline which reaches the cylinders is then lost through the exhaust pipe.

LOOK FOR

- ☐ Leaks in the high-tension cable
- ☐ A weak coil
- ☐ Worn, dirty, fouled or incorrectly gapped spark plugs
- ☐ Faulty ignition timing
- ☐ Incorrectly adjusted or worn distributor breaker points
- ☐ An inoperative distributor spark advance unit



A driver who wants to save gas keeps two "gas-gulping" facts in mind: (1) The more the accelerator pedal is hit, the more gas is wasted; (2) the more a car's engine is allowed to idle, the more gas is wasted. In other words, stop-and-go driving around town consumes much more gas than highway driving.

Here are some ways you can stretch your fuel dollar by using intelligent driving techniques. Try one or more of them for a week or two, then check your mileage again to see how much—or if—your fuel bills have been reduced.

- **Avoid needless idling.** Three minutes with the engine idling and the car standing still uses as much gas as driving one-half mile at 30 miles per hour. Repeat: *avoid needless idling.*

- **Use a steady foot on the accelerator pedal.** When starting from a standing stop, press the gas pedal slowly and steadily. Avoid jackrabbit starts—and stops, too. "Flooring it" and then backing off burns up gasoline which isn't needed for acceleration in the first place. Maintain steadiness of acceleration and de-acceleration at cruising speeds as well. Don't run up on the tail of the car ahead only to have to brake down because you can't go anywhere anyway.

- **Use correct passing procedure.** Never run up on the car ahead, slam down on the brakes, then hit the accelerator pedal



ANY LEAKAGE OF GASOLINE or loss by evaporation is wasteful. Check all gas lines and tighten up on any loose connections, especially around the carburetor



A CLEAN CRANKCASE VENT VALVE helps conserve gas. To clean or replace it, remove the cover and pull away vent line. Check manual before doing this job

ENGINE/POWER TRAIN GAS ROBBERS

The engine and power train are prime sources of fuel loss. Often the trouble can be traced to the valves. Regular maintenance and particular adjustments in this area can help save much fuel over a period.

LOOK FOR

- ☐ Compression loss
- ☐ Burnt or sticky valves
- ☐ Improperly adjusted valves
- ☐ A defective crankcase ventilation regulator valve
- ☐ A frozen manifold heat control valve
- ☐ A restricted exhaust system
- ☐ Improperly adjusted automatic transmission



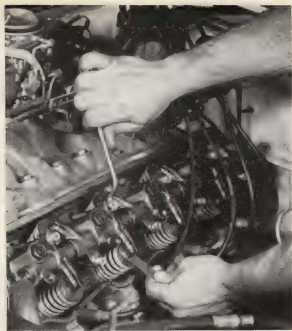
AREAS OF GAS LEAKS

Leaks account for most of the gas that's lost before it reaches the engine. Stop leaks by battening down on connections and sealing up seams. The most likely places where leaks will occur are . . .

HERE—

- ☐ In the fuel line where it connects to the carburetor
- ☐ In the fuel line where it enters and leaves the fuel pump
- ☐ In the seams of the gas tank filler neck
- ☐ At the gas tank cap
- ☐ In the gas tank itself





VALVE LASH of those cars with mechanical valve lifters should be checked periodically. So should the valve clearance of engines with hydraulic lifters

to pass. Start the pass well back of the car ahead to permit yourself a smooth swing out and in again.

- *Drive at moderate speeds.* Once the car shifts into driving gear, gas consumption increases as speed increases. Stay within posted speed limits; these are considered "moderate" as well as safe.

- *Don't brake unnecessarily.* Try to time traffic lights, for example, so you can keep rolling without stopping. You'll use more gas by stopping and starting again than if you can manage to coast to the light just as it turns green; then reapply a steady pressure on the gas pedal while you're still moving.

When you must stop, let your engine act as a brake. When approaching a stop sign, for instance, let up on the gas pedal at a sufficient distance from the sign to allow the engine to slow the car so only a minimum use of brakes is needed. This conserves not only gas, but also the brakes.

- *With a manual shift car, use your brakes instead of the clutch when waiting for a traffic light on an uphill grade.* "Riding" the clutch and revving the engine to keep from stalling wastes gas and increases clutch wear. Shift into neutral (or keep the clutch disengaged) and use the brake.

- *Never fill the gas tank to the top, especially in hot weather.* Gas expands as it heats up and may overflow a brimful tank. Always leave an air space of a few inches between the top of the gas and the top of the filler neck.

A car's not a greased rod moving through a vacuum. On the contrary, forces reacting against its forward motion act to hold it back. These forces (resistances) are both *natural* and *mechanical*.

In the first category are included such elemental forces as head winds, snow, mud—and hills (gravity).

A car's inherent mechanical resistances include the weight of the vehicle, friction generated by its movement through the air and the friction of the tires on the pavement.

Bucking all these resistances is engine go-power. A gas-efficient engine will overcome resistance by using a minimum amount of power. Just one mechanical flaw which reduces peak power means the engine must furnish just that much *more* power to overcome these forces. In generating this power the engine uses gas. So in your own attempts to increase gas mileage, bear the following two considerations in mind:

1. Reduce to a minimum those resistances over which you have control.
2. Maintain the car at peak mechanical efficiency so it can achieve maximum performance using minimum power.

Aim for peak efficiency

An important point in maintaining engine efficiency is to insure that no gas is lost by leakage because of a break in the sealed fuel system.

Tire pressure, too, is an important governing factor in fuel consumption. With less tire surface in contact with the road, less friction exists, thus less gas is consumed. This *doesn't* mean you should jam 45 pounds of air in your tires. However, slight overinflation—about five pounds over recommended pressure—is acceptable in most cases. *Underinflation* will substantially reduce tire life.

Wheels that are out of alignment are another cause of fuel-frittering friction. So is a hung-up brake that puts a drag on the wheels.

The mechanical failures that can rob your engine of power and cause it to waste gas are too numerous to discuss individually. We've done the next best thing by listing the most common causes in troubleshooting check-off charts on pages 185 and 186. If you discover your car is a gas-burner and are satisfied your driving habits are not at fault, spend a couple of Saturdays on the repairs and adjustments indicated on the check-off lists. The effort you put into this area of car maintenance now *may* pay off with a saving of \$100 to \$200 in gas and/or repairs over the next year's driving.

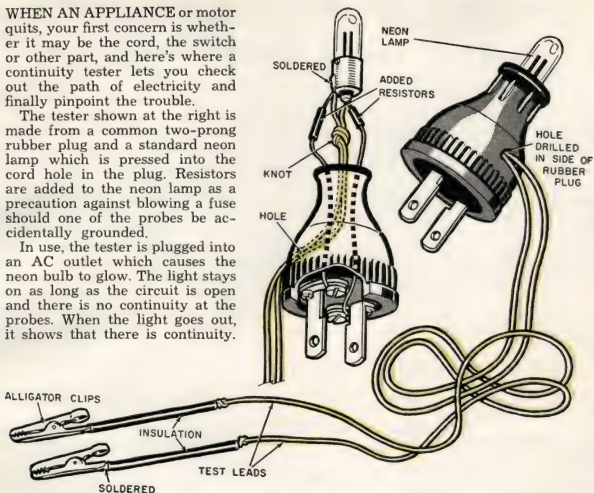
★★★

Make a Continuity Tester for Your Appliance Test Bench

WHEN AN APPLIANCE or motor quits, your first concern is whether it may be the cord, the switch or other part, and here's where a continuity tester lets you check out the path of electricity and finally pinpoint the trouble.

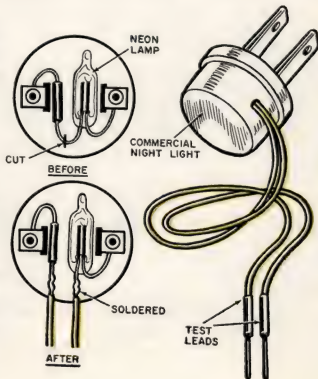
The tester shown at the right is made from a common two-prong rubber plug and a standard neon lamp which is pressed into the cord hole in the plug. Resistors are added to the neon lamp as a precaution against blowing a fuse should one of the probes be accidentally grounded.

In use, the tester is plugged into an AC outlet which causes the neon bulb to glow. The light stays on as long as the circuit is open and there is no continuity at the probes. When the light goes out, it shows that there is continuity.



By Joseph Braunstein

This continuity tester differs from the one above in that it glows only when the electrical path is found broken, or interrupted. Both testers serve the same purpose but are simply made from different common electrical parts. This one is made from a plug-in neon night light which is taken apart and altered as indicated in the before-and-after wiring diagrams. Lamp-cord leads attached to the severed wire between the resistor and the neon lamp, are brought out through a hole made in the side of the plastic cover, after which the circular bottom is pressed back inside the cover and phone-tip probes are attached to the ends of the leads. You can obtain this particular night light at most any hardware or 5 and 10, but if you can't, you can order one for 39 cents from Signalite Co., Neptune, N. J.



FOR YOUR SABRE SAW

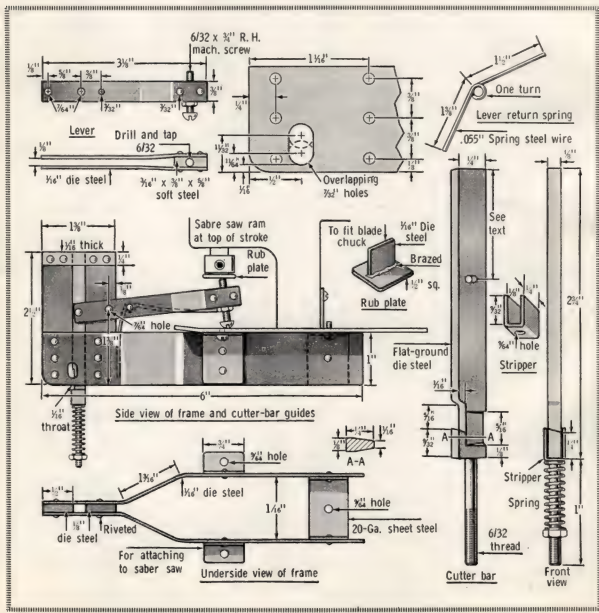
By Howard W. Teter

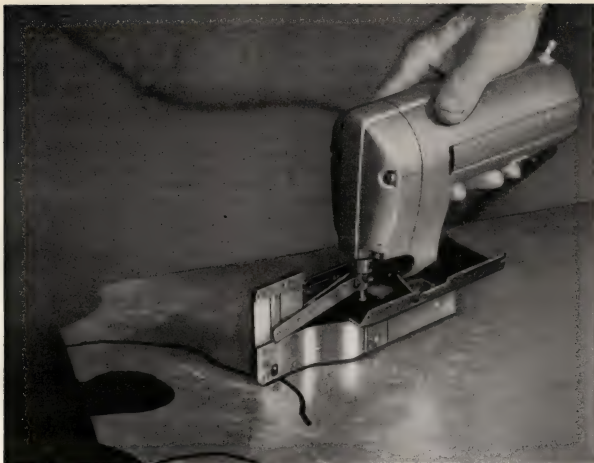
NO TOOL YOU CAN BUY lets you zip through all kinds of sheet metal with the ease of this homemade attachment. Its frame bolts to the base of your sabre saw to let you run straight cuts or chase yourself around dizzying curves, while the jiggig cutter bar nips out 3000 tiny squares of metal per minute—and leaves in its wake an edge so smooth that little or no finishing is needed.

And it's not a finicky eater, either, since it bites with equal gusto into galvanized

iron, brass, aluminum, auto-body steel and sheet plastic. When you detach it to go back to woodcutting, you're likely to find the saw downright confining and sluggish by comparison!

The dimensions below are geared to saws with the usual 1/2-in. stroke. Nearly all parts are made of flat ground oil-hardened die steel, available from most tool supply houses. You'll need two 18-in. pieces (the minimum length sold): one 1/16 in. x 1 in., the other 1/8 in. x 5/8 in.





These shouldn't cost more than \$4 total. Such steel is accurately ground to size on all surfaces, which simplifies your work. You can get the wire for the two springs by unwinding larger springs, chosen for proper wire size from the assortment at your hardware store.

After cutting the two 6-in. pieces of $\frac{1}{16}$ -in. stock for the frame, lay out and centerpunch on one of them the locations of all rivet holes and the overlapping holes for the chip opening. Now clamp the two pieces tightly together to drill both at once. A little filing brings the chip opening to a smooth oval. Don't bend the sides yet—leave them flat. Though bends are indicated in the side-view sketch, far-left center, the dimensions given for these members are *before* bending.

Cut two cutter-bar guides from $\frac{1}{8}$ -in. steel and clamp the forward one to one frame side so that the factory-ground edges will be next to the bar, and at the bottom. Using the holes in the frame side as a template, drill the rivet holes through the guide. The rear edge of the guide covers half the chip opening, so scribe the opening outline on the guide and, after unclamping, arc out the excess with a round file—but be sure you don't file the $\frac{1}{16}$ -in. web at the bottom of the hole, as this forms one of your cutting edges.

Clean any oil from mating surfaces and rivet these three pieces solidly together. My rivets were nothing more than some 6d nails, pushed through the holes and snipped to the right length for "upsetting."

To form the cutter bar (from the same $\frac{1}{8}$ -in. die steel you used for the guides), study the sketches. Note there are two views: the left one has the piece turned enough to show perspective, while the right sketch is a straight-on edge view. The overall length of the blank is $3\frac{3}{4}$ in.—and if you cut it $\frac{9}{32}$ in. wide you'll have some leeway for filing the sawn edge smooth, and perfectly parallel with the factory-ground edge. The final width isn't critical as long as it is uniform from end to end within about .001 in.—not as difficult as it sounds, since as you file the cut side you check frequently with a hand micrometer after the saw-tooth marks disappear.

Slip the blank between the frame sides and snug it against the front guide. Place the rear guide tightly against the blank, drill the holes and rivet the guide in place. (For added rigidity, rivet a $\frac{1}{16}$ -in. strip across the tops as shown.) Remove the blank and slim it slightly by rubbing it lengthwise on a sheet of fine emery cloth laid on a flat surface. When you reinsert

(Please turn to page 200)

Metal Scriber from Pen

YOU CAN CONVERT that used-up ballpoint pen to a smart-looking pocket scriber having a retractable tungsten tip. Here's how:

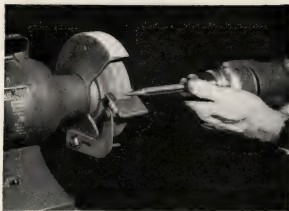
Use a pen with a *metal*—not plastic—ink cartridge. Take the pen apart and remove the ballpoint with pliers. Then use a needle and heavy thread to clean ink from the cartridge. Crimp the shoulder of the cartridge to prevent the scriber—

a $\frac{3}{32}$ x $1\frac{3}{8}$ -in. length of tungsten—from slipping into the cartridge. Assemble the pen and check to see if the scriber retracts (you may have to grind it down). Disassemble the pen, remove the cartridge and dab some rubber cement into the cartridge neck. Re-insert the scriber and reassemble the pen. Crimp the neck of the cartridge as the point wears out to maintain length of scriber.—*Mike Brenish*



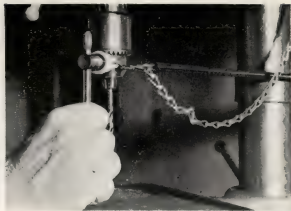
FIRST REMOVE METAL CARTRIDGE from ballpoint pen (left), and remove ballpoint with the aid of pliers and an adjustable wrench locked at the neck and shoulder of the cartridge. Next, obtain a $\frac{3}{32}$ x $1\frac{3}{8}$ -in. length of tungsten from a welding shop, grind a point on it, and insert the blunt end into the neck of the cartridge (center) after the latter has been dabbed with some rubber cement. Finally, enlarge the opening in the tip of the pen with a No. 17 drill bit (right) to accept the $\frac{3}{32}$ -in. dia. tungsten scriber

Pointing a Prick Punch



To put a new point on a prick punch, chuck it in a hand or power drill and hold the point against the grinding wheel at the desired angle. The double rotation of the drill and grinder speeds work and provides a perfect point.—*Wayne M. Judy*

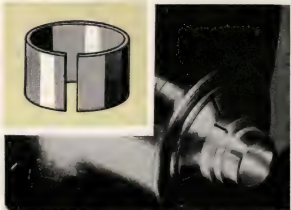
Safety Spring for Chuck Key



To avoid accidentally leaving your chuck key engaged when turning on the drill press, hang it from a length of screen-door spring. This will supply enough tension to pull it free after use. Hook the spring to a slip-fit yoke on the key.

Collet Spacer Sleeve

Work of nonstandard diameter can be made to fit any oversize collet by using a simple sleeve adapter. To make the split sleeve, turn and bore bar stock to the correct outside diameters to fit both work and collet. These diameters must be precisely concentric. Once all turning and boring is completed, split the sleeve with a hacksaw. Such sleeves work fine for turning out a limited run, and can prove to be lifesavers for precision second-operation lathe jobs.—*H. J. Gerber*



NEXT MONTH IN

SHOP AND CRAFTS



CARTS, CARTS, CARTS. Anything is handier if it's on wheels, so February's **PM** features a basic chassis that adapts to seven types of carts. It's a glamorous host cart with a built-in hot tray for tableside or party-buffet service. Alter the plans a bit and it's a bachelor's bar, instead. Or an equipment cart for cookout. Or three different outdoor work and storage counters: one for the Saturday Mechanic, one for pruning and potting, or one for yard sports

SHEET-METAL FORMER. You can turn out any cylindrical shape in your own workshop with the homemade slip-roll former shown at left. Great for custom tubing, drums or special parts. See the plans next month

WALL FASTENER GUIDE. Here's one you'll want to clip out and save—an easy-to-understand selector chart telling the perfect fastener for any hanging job, whether the wall is solid masonry or hollow-core. Complete in February

WIRELESS MIKE IN YOUR SHIRT POCKET

Microcircuits are the newest, hottest, tiniest

electronic devices around. Put

them to work for you in this

little license-free radio

transmitter. Use one of the

newest circuits and get four

transistors and associated re-

sistors in a package the size of an

ordinary transistor case. While you're

at it, try some experiments of your own

By John Potter Shields

TINY TRANSMITTER nestles in the palm of your hand. When not being used it is small enough to tuck away in any convenient pocket. Use of new microcircuit cuts down on the amount of wiring and reduces chances of error

A TINY POCKET BROADCASTER is a heap of fun and has a practical side, too. Use it for short-distance transmissions to a nearby standard AM radio receiver. Use it at parties to show your friends what they might sound like running through a soap commercial. Use it with a nearby portable radio and you have a public address system.

This wireless mike is built around a miniature microcircuit—a complete electronic circuit in a single-transistor case. To build the transmitter we have used four of the transistors in the unit and several resistors.

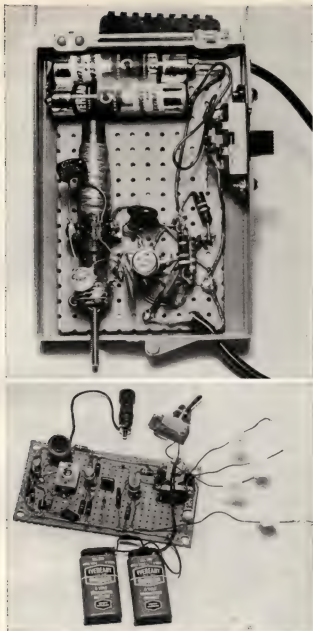
To assemble your own unit you'll need a 3 x 5-inch piece of perforated phenolic

board as a chassis. Use small brass eyelets or flea clips as tie points. The microcircuit is connected into the circuit through a special plug-in, 10-contact socket.

The antenna coil is fastened to the board by winding several turns of bare hookup wire (No. 20) around the metal end of the coil. Secure the wire with solder, pass the two ends through eyelets in the chassis board and solder in place.

After mounting all parts on the board and doublechecking the wiring, cement the chassis inside a plastic case. Depending on how carefully and compactly you build, you will be able to use a case that is 3 x 5 x 1 in. or smaller.

Since the unit draws little current, the

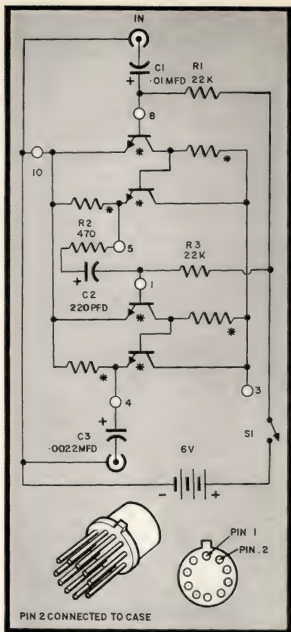


READY-TO-OPERATE UNIT is at top. Just close the lid of the case and you're ready to operate. Lower photo shows wired phenolic chassis ready to mount in case

two penlight cells that power it are cemented to the case. Use a contact cement so you can pry them loose for replacement when necessary.

To reduce the size of unit to a minimum you can use smaller batteries and a smaller antenna coil. This will take some experimenting on the builder's part, but can pay off with a matchbox-like transmitter.

After completing the unit you are ready to put it on the air. Place the wireless mike close to an AM radio and switch both sets on. Adjust the antenna coil on the transmitter so the tuning slug is about midrange. Now tune the radio through the lower end of the broadcast band (550-900 (Please turn to page 212)



FOUR TRANSISTORS make the mike work. Numbers by circles in the circuit indicate terminal pins of the microcircuit. Check against pin layout diagram

PARTS LIST

Resistors

R1—22,000 ohms, 1/2-watt carbon

R2—470 ohms, 1/2-watt carbon

R3—22,000 ohms, 1/2-watt carbon

Capacitors

C1—.01 mfd disc ceramic

C2—220 pfd mica

C3—.0022 mfd disc ceramic

Miscellaneous

Microcircuit—Motorola MC-306

Microcircuit socket—Cinch 10-1C3

L1—Antenna coil (Olson L-73 or equiv.)

S1—s.p.s.t. slide switch

Battery—2 penlight cells (size AA)

Crystal microphone

Contact cement

Phenolic perforated board (3 x 5 in.)

Flea clips or brass eyelets

Plastic case, 3 x 5 x 1 in. (smaller if you use a smaller chassis)

Private ear for silent tv viewing

Wireless pickup brings TV or phono sound to your ears through an individual receiver without disturbing the rest of your family.

By Steven Hahn

SOONER OR LATER we all need a private wireless communications system for baby-sitting, paging people, listening to music while doing housework, or listening to the fights while Junior has to do his homework in the next room. Here's a little unit that can solve all of these problems, yet costs about \$3 per receiver.

The principle is audio induction. Any audio amplifier with a power output of 10 watts or more will serve as a transmitter. The antenna is a loop of wire strung around the area in which the receiver will be located. The receiver is an induction-type telephone pickup coil connected directly to a sensitive crystal earphone.

To get the best possible results from this system the amplifier output impedance must be matched to the antenna impedance. The antenna is strung around the area to be covered and can be nailed to the molding or placed under the rug. It is



made of ordinary single-conductor insulated wire. Since the impedance of such an antenna is the same as its electrical resistance use a length of wire that gives a match to the output transformer on your amplifier. If you check the table you will note that resistances are listed for several sizes of wire. For example, if you use 100 ft. of No. 10 wire, the total resistance is 2.7 ohms, a reasonable match to a 4-ohm transformer output.

If you find the wire you use does not match the transformer too well, you can still get proper matching with an inexpensive public address matching transformer.

With the 10-watt amplifier you can cover an area of about 20 x 40 ft. To cover larger areas, you'll need more power. Several possible loop arrangements are shown in the diagrams.

The receiver is a cinch. It uses no transistors or tubes, has no batteries and never

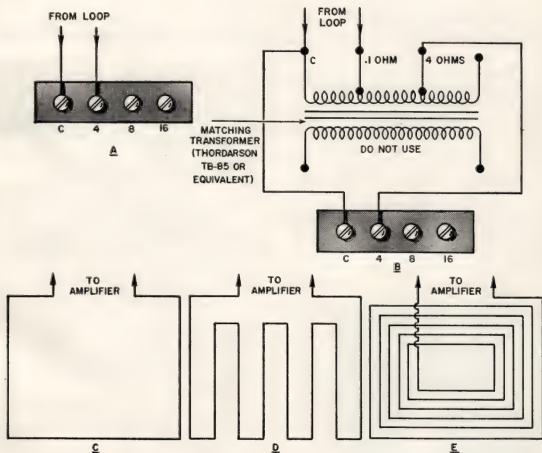
wears out. Solder and tape both leads.

In operation, the loop is connected to the amplifier and the amplifier turned on. The telephone pickup coil is carried so it sits vertically—in a man's shirt pocket. Amplifier volume is turned up until the signal can be heard in the receiver throughout the entire area to be covered.

The audio amplifier can be driven by a microphone, record player, radio or television set and has a thousand and one uses in every home. ★ ★ ★

RESISTANCE OF SINGLE-CONDUCTOR WIRE

Gauge	Resistance Per Foot (Ohms)
10	.0278
12	.0442
14	.0703
16	.112
18	.178
20	.283
22	.449
24	.715



WIRING HOOKUPS for your private ear. Here's how to connect a loop to the 4-ohm output of your amplifier (a). If you don't have a 4-ohm loop you can use a matching transformer (b) to make a proper hookup. You can also wind a single loop (c) around the room or use an in-and-out loop (d). Best coverage of all is a spiral loop (e); obviously, an excellent arrangement to use under a rug



HAND-SIZE ALARM slips easily into pocket or purse. Pushbutton switch turns on its reassuring warble when you're in trouble

Pocket Policeman

Traveling deserted streets at night? Take this pocket alarm siren along. It offers an added measure of protection that will cost you less than \$10

FORCED TO WORK LATE? Must you travel sparsely settled areas at night? Let the Pocket Policeman help you. Its warbling alarm can deter the would-be assailant long enough for you to reach safety or arouse the attention of others.

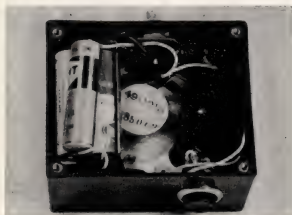
Basically, the unit is a pocket-size alarm which simulates a police car siren. Two pushbutton switches control it. One turns the alarm on and off. The other varies the pitch of the alarm to give it a warble similar to that of a police siren.

If you need more volume than the unit

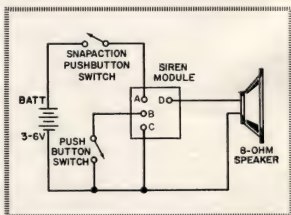
delivers, use a larger speaker. But keep in mind that this will reduce battery life. There are a minimum of parts and assembly should be no problem. Just follow the wiring diagram. Above all, make certain that the battery is wired correctly before turning the unit on.—William S. Gohl

PARTS LIST

- Cordover siren module SM-1
- Penlight cells, 2, 3 or 4
- Miniature speaker, 8-ohm
- Pushbutton switch, momentary contact
- Pushbutton switch, snap-action
- Case to suit, miscellaneous hardware



HEART OF THE ALARM is the electronic circuitry which is revealed when the case back is removed. Small components make the pocket-size unit feasible



SIMPLE CIRCUIT makes alarm easy to assemble. Besides the semiconductor module there is only a speaker, two pushbutton switches and batteries to hook up

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**HARDWARE AND INDUSTRIAL
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NIBBLER ATTACHMENT

(Continued from page 191)

it between the guides, there should be no bind. Now, in the factory-ground edge, carefully file the cutting notch, finishing the bottom edge with a triangular pattern-maker's file so that it slants slightly downward toward the rear and diagonally across the front. The side relief-tapers let the bar turn slightly in the kerf for curve cuts.

To form the stud that supports the stripper and its spring, trim the bottom inch of the blank down to $\frac{1}{8}$ -in. square, then file it round and thread the lower half. Bend the stripper by hammering a $\frac{1}{4}$ -in. strip of 18-ga. (.050 in.) steel around $\frac{1}{8}$ -in. die steel, and cutting to finished length.

The stripper spring must be very stiff. Make it by winding 11 turns of No. 18 spring wire (about .047 in. dia.) around the shank of a $\frac{1}{8}$ -in. drill. Try this: Clamp the drill in a vise with the starting end of the wire clamped in one of the flutes. After winding, grind both ends square. The finished spring should stand $\frac{3}{4}$ in. tall.

Drill your saw base

Now check the guide plate of your saw for spots to drill and tap holes for the machine screws that fasten the nibbler to the saw. Bend the frame sides to take advantage of these spots, rivet fastening brackets in place, then use them as marking templates for drilling the guide plate.

To make the operating lever, clamp the two sidepieces together and drill all holes through both at once. Rivet in the steel block (which is drilled and tapped for the adjusting screw) then bend the sides as shown. Cut two steel pins—one to form the lever's fulcrum, the other to attach the lever to the cutter bar—from the shank of a $\frac{3}{16}$ -in. drill. These should be long enough to protrude slightly on each side.

The rub plate provides a sliding surface on the saw chuck for the end of the lever. If you file a $\frac{1}{16}$ -in.-wide groove about halfway through the plate, you can make a stronger, simpler silver-solder joint.

The final step is to locate the hole in the cutter bar for the pin that joins it to the lever. This dimension is not given in our plans sketch since it can only be determined by trial assembly, as follows: Attach the lever (with its return spring) to the rear guide. The adjusting screw should project about five threads above the top of the lever. After a few tries, you'll be able to stop the saw with the ram at the exact top of its stroke. When the ram is in this position, the cutter bar should be at the bottom of its travel, with

the cutting edge $\frac{1}{16}$ in. below the bottom of the front guide. Slide it to this position and mark the location on the cutter bar through the hole in one side of the lever. After drilling the $\frac{7}{64}$ -in. hole squarely through the bar, widen it slightly with a small rat-tail file until, with the pin in place, there's no binding when the lever is operated by hand through its full travel. You can now test the cutter on cardboard or thin aluminum, but don't cut any hard metal until the cutting edges have been hardened and tempered. To accomplish this, just follow the directions supplied with the die steel. Normally, the procedure is this: Heat the area around the chip opening to a dull cherry red (1450-1500° F.) and quench in oil (plain SAE 20 or 30 is fine). Treat the lower part of the bar the same way, and temper by placing all treated parts in a kitchen oven heated to 550° F. for an hour.

Reassemble, and peen the lever pins lightly on both ends—just enough to keep them from working out. Oil the sliding surfaces and lever pins. Slip the stripper and spring on the stud and compress the spring with a nut until it's not quite solid when the ram has pushed the lever all the way down. (Tighten any more than this and you risk breakage: the motor exerts tremendous leverage on the cutter bar.)

Coddling Encouraged

Tender, loving care—and plenty of it—is one of the surest preventives of mental retardation in children. Dr. Reginald S. Lourie reported, during a recent three-day seminar on mental retardation in Washington, D.C., that 75 percent of all mentally retarded cases are caused by sensory deprivation resulting from lack of human attention during infancy. The theory is that the infant mind simply does not develop enough brain cells if it is left alone to organize sensations by itself.

Ancient Apeman Skull

A fossil skull unearthed by Chinese scientists has been declared the most ancient human of the apeman type so far discovered in the world. The well-preserved skull, found at Kungwangling, Lantien county in the Shensi province of China, belonged to a 30-year-old female who lived about 500,000 to 600,000 years ago.

Striking differences indicate its age. It is broader; has a frontal crest and an anterior nasal spine. It has a thicker cranial wall than other skulls found in China and Java and has a cranial capacity smaller than that of the Peking man and about equal to that of the most primitive type of Java man.

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TEACUP SAILING PRAM

(Continued from page 151)

in the area where, later, you'll cut out the 17½-in.-long slot for the daggerboard.

Planking. A half bottom, side, half fore-deck and a side deck can be cut from each 4 x 10-ft. sheet of ¼-in. plywood. Clamp a plywood sheet to one side of the frame bottom and mark the bottom outline on the underside. Then remove the sheet and cut the half bottom slightly oversize; reclamp side pattern adjacent to side and mark side pattern adjacent to curve of bottom shape. Cut the side slightly oversize and lay scraps away to be used later for decking.

Now reclamp the side planking in place and mark it accurately, allowing just enough extra material for fairing. Also, mark the outlines of the chine, clamp and frame on the underside.

Remove the plywood, cut it to shape and drill small lead holes at intersections of frames with chines and clamps. These holes will provide a guide for driving planking screws. Coat the outside surfaces of the frame and the outlined areas of the plywood with glue. Place the planking in position and screwfasten it. Countersink the screws slightly so that surfacing compound can be used to hide screwheads. Clean off excess glue with a damp cloth.

When the glue has set, plane the plywood edge flush with the chine and attach the bottom planking, using the same procedure as you did with the sides. Be careful to stagger screws near the daggerboard slot so that they won't interfere with holes that will later be drilled for bedlog bolts. (This can be done by marking bolt positions on the lower keel prior to planking.) Trim off the edge of the plywood bottom so that it's flush with the side planking along the chine, and cover the joint with a ¼-in. x 1-in. rub rail to protect the plywood edge.

Carlins, beams and battens. Remove all screws holding the boat to the building form and lift the boat off. Turn the hull over and block it so that the hull is supported under frames 2 and 3.

Cut the seat support beam from 1 x 2 stock and position it on the after side of frame 3, just above the plywood gussets. Glue and screw it in place. The temporary crosspieces can now be removed from frames 2 and 3.

Cut the deck beam to length from 1 x 8 lumber and clamp it in position on the forward side of frame 2. Mark the shape of the deck beam, from full width of beam at center down to clamp top on each side. Also

mark extensions of frame 2 for sawing off. Remove the deck beam and position the carlins, using frame 2 and transom top to locate them. Glue and screwfasten the carlins, using spacer blocks to keep them spaced equally from the clamp strip. Now saw off frame 3 extensions flush with the carlin and clamp.

Shape the deck beam, position it on frame 2 and secure it with glue and screws. Cut side-deck supports from ¾-in. scrap and fit under the spacer block. These supports will add stiffness to the planking and help the side decks support your weight if you have to hike out in heavy winds.

Notch the deck beam and stem frame for the 1 x 4 center deck batten. Glue and screw an 18-in. strip of 2 x 2 under the center deck batten below the mast step position. Then, run the 1 x 2 braces from this step support down to the stem knee and fasten in place. Also, fit the small knee under the center batten at stem.

Now fair the entire top of the boat, from stem to stern. Use a straight piece of wood to check the accuracy of your fairing between the clamp and deck batten, and between the clamp and carlin. Notch the deck beam and stem frame to accept 1 x 2 side deck battens, and glue and screwfasten these battens in place.

Daggerboard case. The daggerboard slot is ½ in. wide by 17½ in. long. Lay the slot out with pencil, centered on the keel 16 in. forward of frame 3. Use a ½-in. drill to make starter holes at each end of the slot, keeping the holes inside the overall slot dimensions. Then saw out the slot, using a small keyhole saw for starting and squaring the ends of the slot with a wood rasp.

Make the daggerboard case bedlogs from clear fir lumber, 1½ in. thick. Note that the ends are slightly angled. Clamp the log together in right and left-hand position and shape the bottoms of both bedlogs simultaneously to fit the keel. Then unclamp the logs and, keeping track of right and left log, cut a ¾-in. x 1-in. rabbet along the top inside surface to accept the ¾-in. side panels.

Drill bolt holes near the outside edge so that bolt heads will clear the lower keel when the case is installed. Since these holes should be drilled to countersink washers and nuts, first drill a small pilot hole, then drill the countersink hole for the washer and nut deep enough so that the nut will fit securely on bolt. Complete the hole with a ¼-in. drill.

Cut the side panels from ¾-in. plywood and fasten them in the rabbets cut in the
(Please turn to page 204)



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TEACUP SAILING PRAM

(Continued from page 202)

bedlogs with screws and glue, carefully avoiding the bolt holes in the log. Glue and screwfasten the end posts to one case side, and give inside surfaces of the case two or three good coats of spar varnish, avoiding surfaces yet to be glued. When the varnish has dried, glue and screwfasten the case together, keeping the bottom surfaces of the bedlogs level.

Carefully cut away approximately 1½ in. from each end post so that the posts will fit snugly into the daggerboard slot. Fit the cap supports between the seat beam and deck beam (but don't fasten them in position) and mark the top of the daggerboard case, which should be sawn off flush with the top of these cap supports.

With the daggerboard case still in position, mark the location of the bolt holes on the keel by tapping on a ¼-in. rod placed in the bedlog holes. Then remove the centerboard case and drill small pilot holes, carefully centered on the bolt-hole marks.

With these holes as your guides, use a underside of the planking for seating the bolt heads; then complete the holes with ¼-in. drill.

Saw off the top of the centerboard case as marked. Give all contacting surfaces, holes and bolt heads a good coating of waterproof glue, then place the centerboard case in position, drive the bolts in from underside and tighten up evenly all around. Clean off excess glue with a damp cloth.

Deck and cockpit. Now the cap supports can be glued and screwfastened in place on each side of the centerboard case. Use small blocks of wood of the same thickness as the case to space the supports at the seat beam and deck beam.

Cut the seat, notching the after edge of the ends to fit inside frame 3. Make seat knees from scraps of ¾-in. plywood and fasten to the frame sides. Cut the daggerboard case cap to length so that it makes a snug fit between the deck beam and seat.

Locate and cut a ½-in. x 15½ in. slot above the opening in the daggerboard case. (If you would like to be able to remove the seat and cap, fasten them in place with No. 8 x 2-in. flathead wood screws set in finishing washers.)

Center the ¾-in. x 1¾-in. foredeck trim over the center deck batten, and glue and clamp it. This piece should extend forward of the stem and aft of the deck beam. Cut a small piece of ¾-in. x 1¾-in. material to fit between the cap and center deck trim.

The extended deck trim is cut off flush with this inside trim. Attach the ¾-in. x 1¾-in. stem trim so that it fits under the top deck trim and down over the lower keel. Then cut the top deck trim to match.

From ¼-in. plywood left over from the bottom and sides, cut two foredeck halves and two pieces of side decking. Glue and screwfasten these in place. Trim all around, and install half round molding all around the deck and inside the cockpit. (Molding can be made by ripping 1¼-in. dowel in half.) Glue and screwfasten this in place, and the hull is then ready for application of the finish.

You can assemble the remainder of the sailing equipment while you are waiting for the paint to dry on the hull. The rudder is made by gluing two pieces of ¾-in. plywood back to back. Chamfer the edges and then apply several coats of spar varnish.

Do not drill a hole for the bolt that fastens the rudder to the tiller until you are ready to assemble the rudder on the transom. This hole is then located so that the tiller stop will positively prevent the tiller from rubbing against the top of the transom.

Cut the daggerboard from ¾-in. plywood and place it in position in its slot to mark the top edge. Trim the top of the daggerboard with ¾-in. x 1½-in. strips, and drill a 1-in. hole for a finger grip. Smooth the edges and apply several coats of spar varnish.

Floorboards should be made so that they can be readily removed from the boat. The floor assembly shown on page 148 consists of three 1 x 4s fastened together with crosspieces. The floorboards can rest on strips fastened to frames 2 and 3. Small holding strips fastened to the frames above the floorboards with bolts and wingnuts will keep the floorboards in place.

Sailplan. The sailplan chosen for *Teacup* keeps costs to a minimum. A sail that fastens to the mast in a luff rope slot eliminates the expense of sail track; a loosefooted sail simplifies boom construction.

Since there are many small dinghy-class sailboats with sails of about 50 sq. ft., there seemed to be no point in designing an original sail if an existing design could be used. Furthermore, there are often good used sails available that can serve very satisfactorily on a training boat. A good used Dyer Dhow sail was found to satisfy the author's requirements completely, and the *Teacup's* sail plan was established. The only alteration required on the used sail was the removal of two grommets along the lower edge of the luff.

The holes were patched with sail tape. Thus, for \$30, the *Teacup* had a top quality dacron sail with many years of sailing life left.

If you decide to go the used-sail route, contact used-sail suppliers before you build the mast and boom so that you can alter the spars if you can't obtain a sail to these exact dimensions.

If you decide to buy a new sail, have a sailmaker make the sail to the Dyer Dhow specifications, but without luff grommets. (The author's sail was originally made by the firm of Ratsey & Laphorn, Inc., City Island, N.Y.)

Mast material. Search through your lumber dealer's stock of 4-in. straight-grained fir flooring for two extra-straight pieces. After trimming away the tongue and groove, you'll have about 3 in. left. Cut $\frac{1}{2}$ -in. half-round grooves in each piece by running the board through the saw at an angle to the saw blade (use a tenoning blade if you have one). Remove about $\frac{1}{16}$ -in. of material from the groove to the edge to provide the $\frac{1}{8}$ -in. slot for the sail when the pieces are assembled. Cut a small glue-stop groove in each piece. Then sand and varnish the groove and slot, and glue the mast pieces together, being careful to keep the grooves aligned.

The mast can be rough-shaped on a bench saw and finished with a plane or belt sander. When you attain the smoothness, give it several coats of spar varnish, then attach fittings as shown on pages 150 and 151.

The boom is made from a $1\frac{1}{2}$ -in. dowel. Shape one end to fit the gooseneck; attach an eyestrap and drill a hole for fastening the sail clew at the other end. The boom is then ready for varnishing.

The mast step is cut from a small piece of hardwood. The hole in the mast step should be larger than the oak dowel set in the base of the mast so that the mast can move freely. A large brass washer between mast base and step will reduce wear on wood surfaces. For a sail of approximate dimensions shown on page 151, the mast-step hole should be positioned about 25 in. back from stem. Cut spray rails so that they extend out and aft from the after end of the mast step. The angles shown are approximate; you'll have to cut and try to get an exact fit.

Fittings. You can obtain hardware from a marine supply house, most of which provide catalogs for a small fee. The author selected mostly Wilcox-Crittenden brass and bronze fittings, primarily for their salty look. Stainless steel fittings can be used if you prefer, but the boat will

show off to best advantage if you remain consistent—choose all steel or all brass fittings.

Finishing. Many excellent marine paints and varnishes are available today. Check your local marine supply stores or paint suppliers to find out what seems to hold up best in your area.

The author selected a two-part epoxy paint for the hull. The wood should be primed with at least two coats of epoxy undercoat; apply epoxy finishing coats with a spray gun for best results. The decks, spars and other varnished surfaces were finished with several coats of a good marine varnish, carefully sanded between coats. ★★★

MATERIALS LIST

PLYWOOD (Ext. DFPA, A-A)

- | | |
|-----------------------------------|------------------------------------|
| 2 pc.— $\frac{1}{4}$ " x 4' x 10' | Sides, bottom, decking |
| 1 pc.— $\frac{3}{8}$ " x 4' x 8' | Stem, transom, rudder, daggerboard |

LUMBER

- | | |
|---|---|
| 20 ft.—1 x 4 | Frames |
| 12 ft.—1 x 6 | Frames |
| 14 ft.—1 x 2 (white pine) | Temporary frame bracing |
| 2 pc.—1 x 1 x 10' | For aligning frames |
| 2 pc.—2 x 4 x 10' (white pine) | Building form |
| 6 ft.—2 x 4 (white pine) | Building form crosspieces |
| 1 pc.— $\frac{3}{4}$ " x 4" x 10' | Keel |
| 2 pc.—1 x 2 x 10' | Chines |
| 4 pc.— $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 10' | Clamps and carlins |
| 2 pc.— $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 10' | Bigge battens |
| 1 pc.— $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 10' | Lower keel |
| 1 pc.—1 x 8 x 8' | Deck beam and seat |
| 8 ft.—1 x 4 | Center deck batten and daggerboard case cap |
| 20 ft.—1 x 2 (white pine) | Side deck battens, cap supports, seat beam |
| 1 pc.— $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 5' | Deck and stem trim |
| 2 pc.— $\frac{1}{2}$ " x 1" x 10' | Rip in half for molding |
| 1 pc.— $\frac{1}{2}$ " x 5" x 2' | Chine rub rails |
| 3 ft.— $\frac{1}{2}$ " x 2" x 2" | Bedlogs |
| Assorted pieces of fir, oak | End posts daggerboard case |
| 2 pc.— $\frac{3}{4}$ " x 3" x 15' | Knees, tiller, mast step, spray rails |
| 1 pc.— $\frac{1}{2}$ " diam. x 8' | Mast |
| | Boom |

FASTENINGS

- Flathead galv. or brass screws
No. 7 x $1\frac{1}{2}$ " for planking
No. 10 x 2" for fastening chines, clamps.
Other sizes as required
Assorted brass or stainless steel bolts, washers, nuts
Waterproof glue

RIGGING*

- 1 Set self-locking rudder fittings (#4601)
- 1 Lightweight gooseneck (#6481)
- 1 Stemhead plate, size 1 (#9893)
- 2 Chainplates, 7 in. (#630)
- 2 Finishing plates (#6301)
- 2 Thru-deck fairlead, size 1 (#993)
- 1 Eyestay, size 1 (#275)
- 40' Stainless steel cable, 3/32", 7 x 7, semi-flexible
- 6 Stainless steel thimbles
- 3 Stainless steel mast tangs, 3 in.
- 1 Masthead sheave, $1\frac{1}{2}$ " diam. x $\frac{3}{8}$ " thick
- 1' Standard $\frac{3}{8}$ " track
- 1 Becket block
- 1 Eye block
- 4 Halyard shackles
- 40' 3/16" rope (halyard & traveler)
- 25' $\frac{1}{4}$ " rope (main sheet)

*If you like brass and bronze fittings, Wilcox-Crittenden catalog numbers are given; these fittings can be obtained through many marine supply stores.

SUPERSONIC TRANSPORTS

(Continued from page 92)

In Lockheed's case, this sort of problem was assigned to designer Henry Dreyfuss and his "human engineering" staff. The group came up with the recommendation that the number of ashtrays be cut to three per row of five seats, instead of the five now provided. That cuts cleaning time almost in half. Too, removable containers that can be replaced instead of cleaned are suggested. That also saves time.

Ten and twenty years from now the "average" passenger will be slightly larger than he is today, and so Dreyfuss recommends double or triple seats, with each space separated by arm rests, instead of the individual seats now used. Each passenger gets more room and yet the weight and size of the seating arrangement are reduced.

What's the fastest way to serve a meal, or even a snack, to a couple of hundred passengers? This is important because an SST would be in level flight for not much more than half an hour on a transcontinental trip.

One simple proposal by Dreyfuss is to pack a cold meal including a sandwich in a hinged container stored in a back pocket of each seat or that could be handed each passenger as he signs in, to be eaten at any time. Only a hot beverage would need to be served.

For more elaborate meals the Dreyfuss group suggests a mobile pantry supported on an overhead track and that can be pushed down the aisle. The narrow unit contains racks that hold prepackaged hot meals, together with beverage supplies. Similar mobile units would be used for cold beverages, magazines and even for housekeeping apparatus during turnaround time on the ground.

All engineers agree that the SSTs will be very much like present jets as far as passenger comfort is concerned. The greatest acceleration will be at the start of the takeoff run and will amount to less than half a G, the same as with present jets. The supersonics will climb at a steeper angle than most of today's transports; in fact, you'll remain in your seat until cruising altitude is reached.

Windows will be smaller and there won't be much to see in the harsh sunlight (the glare may be reduced by Polaroid screens), aside from the dark blue of the sky and the curvature of the horizon.

Earlier speculation that the ozone in high altitudes and even solar radiations could be dangerous doesn't seem to be proving true. It's pointed out that U-2 pilots who have flown above 60,000 feet

for hundreds of hours have received no adverse effects. This has been the subject of a special study by the Lovelace Clinic, Albuquerque, N.M. However, ozone has been a problem in some electric circuits. For instance, it can produce arcing between an antenna and the structure. Such troubles are all solved by improved design.

400°F heat from friction

Aerodynamic heating remains the biggest bugaboo and accounts for a host of separate problems. The cabin skin, for instance, will heat to more than 400° F. from air friction. Passengers would actually cook like steaks if this heat seeped inside. This might have a bad effect on ticket sales, so a double-walled cabin is provided, with four inches of insulation between the walls and refrigerated air cooled as low as minus 30° F. circulating through small tubes in the insulation. Passengers and crew will be as comfortable as in today's jets. Similarly, the landing wheels will be contained in airconditioned compartments to preserve tire rubber.

Cabin windows will consist of an outer panel of thermalproof glass three inches thick, an air space and an inner panel. Windows are an expensive nuisance, structurally, and engineers would prefer giving passengers a view of the outside by television, but it's generally believed that passengers would object. So all SST designs are retaining windows.

How to prevent the fuel from overheating and boiling in a "hot" aircraft is another part of the problem. Besides, it's desired to keep the fuel so cool that it can be used as a heat sink to absorb heat from airconditioning and hydraulic systems. This is done in part by insulating the tanks against the heat and by using fuel from the outer wing tanks (which heat up the fastest) for takeoff and climb. Fuel for the rest of the flight will come from tanks buried deeper in the structure where they are better protected from heat.

Both U.S. designs call for a three-man flight crew even though five or six-man crews are the rule today for crossing the Atlantic. One reason is that the SSTs will be in the air for such short periods of time that relief personnel aren't needed. Another reason is that a navigator will no longer be carried: he's replaced by a black box, an inertial navigation system that tells the pilot where he is at all times. This is backed up by radar that shows landfalls and other terrain features.

Lockheed's cockpit mock-up offers a feature that is new to most pilots, though it's used on some military transports. In-

stead of standard instruments with round dials, some information is presented in the form of tapes that move up or down against calibrated backgrounds. The exhaust temperatures of the four turbines, for instance, can be shown by four tapes on a single background. A crew member can check the temperatures with a single glance instead of having to consult four different dials.

Meanwhile, General Electric and Pratt & Whitney are designing engines to power the transports. They'll be enormous engines—each one will develop 50,000 pounds of thrust. One company favors a turbojet with throttleable afterburner, and the other is researching a turbofan in which additional fuel is burned in the fan ducts for thrust augmentation.

\$27 million per plane

Today, Boeing and Lockheed have stepped up their research. They are completing details, developing tooling, and preparing proposals for building two prototype aircraft each and flying them for at least 100 hours of test flight. And they are starting construction of full-scale mock-ups. When this is all completed, a year from now, the next decision will be made: whether one design has won the competition or whether both designs should be carried farther.

It will be a big decision, for this next generation of passenger transports will be priced at around \$27 million each. In the next 20 years it's estimated there will be a worldwide market for close to 600 transports that cruise at 1800 mph or faster. If the United States doesn't lag in developing its designs, we can expect to get much, if not all, of that market. ★★

Jonah May Join Navy

Jonah may join Julie and Jezebel in the Navy. Jonah is a new helicopter-towed submarine-listening device which is being tested for possible joining with veteran air-dropped sonobuoys Julie and Jezebel. The device is designed to eliminate the water noises generated when conventional listening gear is swept along at high speeds.

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CAMERAS

(Continued from page 145)

killed by a light truck. The truck careened into a tree about 500 feet away, then raced off. State police, under Capt. Leo S. Daley, quickly amassed an imposing heap of evidence against the driver. His license number had been recorded by a witness. A rear-view mirror found at the scene matched a broken mounting on the truck. Paint embedded in the tree was proven to match that on the truck. Finally, a piece of bark found in the truck was shown to have come from the tree.

Still, the driver denied hitting the boy, and was making a good fight of it in court. However, two photographs brought a conviction. One showed that the truck's left front fender bore striations that matched the pattern of the corduroy pants the boy had been wearing. The other, even more dramatic, showed how a section of the pants fabric had been flattened by the impact of the bumper, except for one tiny square. It matched a hole in the bumper.

In a similar case, a woman killed by an auto was left lying in the street. A witness described the car in sufficient detail for police to identify the owner, a wealthy man who denied knowing of the accident.

The fatal injury was a penetrating fracture of the forehead, which investigators thought might have been made by the old-style projecting door hinges on the suspect's car. Infrared pictures were taken of the area of the car which was believed to have struck the woman. Sure enough, the photos revealed an imprint of the side of a human face. This imprint, invisible to the naked eye, was left by the natural grease of the woman's skin. When shown the pictures, the suspect confessed.

Bookies are booked

Infrared pictures play an important role in another phase of crime photography—detection of forged or altered documents. By photographing checks, wills, insurance policies and other papers under infrared or ultraviolet light, police can often detect erasures or spots where, for example, digits might have been inserted to raise the value of a check. Such techniques can also restore obliterated writing, as two Connecticut bookies found out.

These men, on hearing police arrive at their establishment, burned their betting slips in a fireplace. Much to their dismay, however, the police lab placed the ashes between sheets of glass and photographed them under infrared light, revealing the names of several nags running that day.

Another case of photographing the near-invisible led to the arrest of a thief in

Rochester, N.Y. A very faint set of his fingerprints was found in the dust on a suitcase lid. Since bringing out these prints with the usual dusting techniques would have destroyed them, police shot the prints on high-contrast film under low-angle light. Result: a clear set of prints.

Photography also serves the law by preserving "perishable" evidence. In Canada, two men robbed a loan company and, while maneuvering their car for a getaway, backed into a snowdrift to form an imprint of their license number. Officers spotted the imprint, clicked a camera and arrested the pair within two hours.

Color prints effective

At the moment, perhaps the biggest news in crime photography is the increasing use of color film. This medium, with its heightened realism, made its court debut rather humbly in 1943, when color photos helped convict a Denver butcher of trying to sell putrid meat. Today, police departments all over the country are switching to color film for mug shots.

In Los Angeles, a test showed that 75 percent of the victims who could not identify a black-and-white photo of a criminal were able to identify the same man in color prints.

A number of states now send color photos of all parolees to their parole officers, to discourage a parolee from sending a stand-in to report to the officer every month. And, in Washington, D.C., a pioneer in color mug shots, color-identity photos are now required on all drivers' licenses.

But Indiana lawmen once found that color film's realism can be a two-edged sword. When a mechanic was convicted of beating and slashing his wife and daughter to death, photos of the corpses were shown to the jury, along with shots taken during and after the autopsy. A higher court reversed the conviction on the grounds that the autopsy photos proved nothing pertinent to the case and were so gruesome as to be prejudicial to the defendant's rights. A new trial was ordered. For the most part, however, color pictures have gained wide acceptance in the nation's courts.

Where does crime photography go from here? There seems little doubt that it will find wider and wider application. For, as photography becomes easier, and cameras more mobile and less expensive, any police department, industrial plant or private individual can record solid evidence on film. Maybe it's unrealistic to say photography will put an end to crime. But we can say it's making it tougher and tougher to earn a dishonest day's pay. ★★

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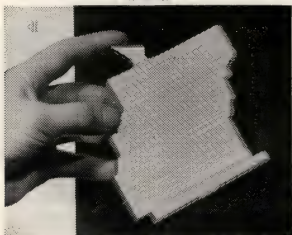
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THE GREAT RELAXING BONANZA

(Continued from page 125)

Yoga, that physical philosophy, is booming. Turbaned teachers are happily instructing a growing group of eager pupils to cast off their worries through breathing, position and meditation. Once the butt of comedians' jokes, yoga is slowly achieving a sort of respectability. "I don't go for all that business of thinking beautiful thoughts," says a top corporation executive, "but the exercises are great for unwinding."

Other companies, alarmed by the skyrocketing rate at which their top executives are decommissioned by such tension-related maladies as high blood pressure, mental illness, ulcers and even alcoholism, have taken a long somber look and then put preventive programs into operation. Many firms will now foot the bill for relaxing courses, private gym membership, art lessons or even psychiatric help.

Still in the experimental stages, results of these programs have not yet been tabulated. "But if it works," explained a personnel manager, "it's a cheap solution to an expensive problem. Every time a department head conks out, it costs us a fortune in time for all the other people under him."

Newest gimmick is relaxation via long-playing records. Specially selected music is softly recorded by subdued orchestras of gentle string instruments. The musical style, known to Tin Pan Alley as "gutless," has no beat and less rhythm. Designed to induce sleep, 15 minutes of it would probably close the dance halls.

On the other hand, last July the Saun-



ders Recording Studio in New York got a frantic call that sent a recording crew

with full equipment to Times Square. The taped cacophony of screeching taxi brakes, police whistles, rumbling motors and auto horns was rushed via special messenger to a Catskill resort. A garment tycoon was going out of his mind with nothing but crickets outside his bedroom window.

Latest gadget to join the parade of the soothers are the home vibrators. Business, according to an industry spokesman, is boom-mm-ing. Many of these shakers are scaled-down versions of a device that's pretty common in better equipped barber shops. John Oster, largest and oldest manufacturer of small size units, has been selling them to tonsorial parlors for over 25 years. Preceded by a shave and followed by a hot towel, a vibrator massage treatment in the well-muscled fingers of an experienced barber is an utterly luxurious experience.

What's new about all this shaking is the fact that the vibrators have made a



sales shift. Most of them are now being sold for home use in a rapidly expanding market that grossed over 30 million dollars last year. And if sales continue at the current pace, final tally for this year should be double that figure.

Although hand vibrator units proved to be quite popular, what really sparked the bonanza was the introduction of low-cost vibrator cushions. They take even less energy to use. If physical tension has left you in such a rocky and rattled state that you aren't up to running a massager over your aching neck or legs, just plug in the cushion, lean on it, stretch out or sit on it to localize the treatment.

The vibrator cushions are now sold in almost every department and chain drug store in the country with a list of claims that include relaxing, reducing, stimulating circulation and easing heart tension.

Most of this is bunk! At least that's the opinion of Owen K. Murphy, president of Niagara Therapy Mfg. Co., whose five factories pour out a torrent of hand mas-

(Please turn to page 212)

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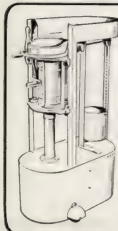
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THE GREAT RELAXING BONANZA

(Continued from page 210)

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Biggest market for the Cyclopads (as the massage cushions are known) comes from businessmen. The units are a standard fixture in the plush but nervous offices of such top corporations as U.S. Steel, United Air Lines and Burlington Industries. Arlene Francis, one of the busiest performers in the ulcer-producing television industry where heart attacks occur with ominous 13-week regularity, is firmly addicted to the habit. Also on the list are such nervous notables as King Ibn Saud, a handful of South American presidents, golfer Cary Middlecoff and several members of major league baseball teams.

The pills, potions and gentle persuaders have arrived just in time. The average guy, caught up in the tempo of a world wildly tense and growing more complex, feels a constant tug at his mental buttonholes. But, thankfully, there's a tonic for every twitch. ★★★

WIRELESS MIKE

(Continued from page 195)

kc.). Somewhere in here you will pick up the transmitter signal. It will sound like a whistle or a quieting of the radio's background noise. Speaking into the mike will produce a strong signal from the radio.

If this doesn't work, there may be a strong local station on the mike frequency. To avoid this problem set the radio to a vacant frequency at the low end of the band and adjust the antenna coil slug in the transmitter until you can transmit on that frequency.

A final tune-up of the radio and the antenna coil adjustment will give the best range and tone.

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CARVING WITH ROUTER TEMPLATES

(Continued from page 180)

trace the slots directly from the projection. Where this is not practical, lay out as described and then remount the plywood square in front of the projector and throw the image onto it once again, as a check. Your layout slots will be narrower or wider than the projected image but the lines should be parallel.)

Now use a jig or coping saw to remove the slot areas and sand or file the edges to be sure the template tip moves freely through the full length of each slot.

Cut a $\frac{3}{8}$ -in.-deep groove around all four edges of the template to take the hold-down clamps. These clamps can be made from corner irons, such as those used to repair storm windows. Make the frame and clamps first, and use them to position the blanks for projection.

You can achieve a variety of effects by using router bits of different shapes and sizes. And for the signboard, you can use plywood, chipboard, rough-sawn or planed lumber—or even plexiglas and other plastics. Often you can rout directly into doors or wooden wall panels.

Sander vs. paintbrush

Smooth raw-wood surfaces are easiest to finish however, as shown in the bottom photos on page 180. It's a simple matter of coating the routed surface, then sanding the surface back to raw wood and brushing on a sealer or exterior varnish. If you use dark brown paint, the letters will appear to be burned into the wood with a branding iron. If you prefer a painted background with letters in a contrasting color, brush on your background coat first; the recessed letters are still much easier to paint than surface letters.

For decorative designs, such as emblems or silhouettes, you can create special templates by photographing a sketch of the design on a 35-mm transparency. This slide will be your own Project-a-Plan.

After working with the lettering templates awhile, you may want to make several additional ones which combine two or more of our slot layouts into one continuous slot—thereby eliminating some of the template shifting. One word of caution before the shavings start to fly: it's a good idea to first lay out all the lettering in pencil, by tracing through the template. This not only gives you practice in selecting which slots you'll need for a given letter (as listed in the chart on page 178)—it may also spare you the plight of the well-known gent who got to the edge of his "PLAN AHEAD" sign to find he'd left no room for the "D." ★★★

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SNOWMOBILE

(Continued from page 129)

the tree with a ski on either side. I had to pull it out: 369 pounds in deep snow. I would lift the track in the rear and fall back, moving it a couple of inches at a time. The temperature was below zero, but the sweat was running off me. I almost had it free when another competitor came roaring around the turn, I jumped aside, but he hit the machine, slamming it right back up against the tree. He kept going.

"Sportsman!" I shouted.

I went back to lifting, tugging, hauling and wondering what on earth I was doing out in the wilds of northern Wisconsin. When I first heard about the Hodag Marathon it seemed like the ideal way to learn about snowmobiles, the newest craze to take fire in winter sports. A race from Rhinelander to Eagle River. Great fun.

With a last gasp I freed the machine, got it started and rejoined the race. The worst, as they used to say in popular novels, was yet to come. The seat on the machine was wet and slick with snow. On almost every turn I'd slide off and land in a snow bank. At one turn I forgot to release the throttle and the machine went bouncing along, dragging me after it.

When I came rattling into Three Lakes, Wis., for a ten-minute break, it was like climbing out of a cement mixer. I was handed a cup of coffee, but I was still shaking so hard it all splashed onto the ground. I took a second cup through a straw with a woman holding the cup.

And to prove to you that my brains were totally scrambled, at Three Lakes I learned that I was making good time, so I was suddenly eager to get going. I didn't have a chance of winning, but I wanted to bear down on the final leg and make a respectable showing. No fool like an old fool!

Out of Three Lakes there was a long stretch of frozen swamp. It was wide open, so you could run at top speed, but there was a stiff crosswind blowing snow that caked on the goggles. Unable to see, I couldn't keep the skis in the tracks, and when one ski would suddenly dig into deep snow the machine would give a lurch and turn over. There were also numerous hummocks, and I went off these like a ski jump, slamming down on the far side with a bone-jarring jolt.

On this stretch I came across a girl who was stopped on the side of the trail. I slowed down. She was crying, her face buried in her gloves.

"Are you all right?" I asked.

"Oh, shut up, and leave me alone!" she snapped.

I can take a hint. I shoved off. There

was another place, a ditch, where you dropped straight down about 12 feet, hit the bottom and then roared right up the other side. And the worst was a logging road, a long washboard hill where you would sail off the top of one hump and slam right into the rise of the next one. It almost finished me. After 10 minutes, I stopped and just staggered around.

But then, believe it or not, I continued. And I was learning plenty about riding a snowmobile. In rough terrain you have to ride the handlebars, standing on the side running boards and taking the shocks with your legs. I was riding it like a sack of wheat and it was like being slammed against a brick wall for two hours. I also realized that if I hadn't been racing against time, this trip through the woods could have been exhilarating pleasure. The snowmobile will go almost anywhere, and when you get stuck, instead of manhandling it from the rear, you grasp the front of the skis, bouncing them around until they're downhill, and then use the engine to free the tread. It's easy when you're not exhausted. And these machines will take unbelievable punishment.

Competitor crashes head-on

On the final leg of the race I was running neck and neck with another snowmobile. We came down a swooping hill and up the other side, and at the top the trail narrowed. I got there first, but he kept coming alongside. Over the crest of the hill there was a sharp drop and the trail went to the left. I managed to stay with it, but he had jumped the crest and was airborne. He fell off in mid-air, and the machine crashed into a tree about six feet above the base. I slowed down, but even before I could stop he had his machine upright, it was still running, and he was plowing back to the trail.

Coming out of a stretch of woods, the course turned left and ran along a railroad bed. And there in the near distance was Eagle River. At this point I was totally exhausted. I was sitting on the seat, just hanging onto the handlebars, keeping the throttle pressed, my senses too numbed to think or feel.

But there's always a reserve of ham. When I came off the railroad tracks, and saw the crowds of people lining the main street, I was up on one knee, giving it all the throttle I could muster. In that little town you had the feeling that the whole world had gone snowmobile goofy. I came sliding and bouncing around the turn into the main street and gunned it to the finish line with classic style. And then someone said, "Congratulations, you finished."

Ah, well, you can't win them all. ★★ ★

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CLINIC FOR SICK CARS

(Continued from page 119)

if you bring the car back in two weeks.

Are they worth the cost? Yes, if you like your car to operate at close to peak efficiency and safety. How else can you find what's causing an engine to miss going up a hill at high speed? Without loading down the car with expensive equipment, the mechanic can only head for the nearest hill and hope to duplicate the complaining customer's driving conditions. He can't be under the hood and driving the car at the same time, and even if he could, he'd probably run out of hill long before he could trace the trouble.

For the skeptics who think they themselves can keep the family car running perfectly (and that included me in the beginning), I performed an experiment. I had noticed, over the two-month period of this assignment, a gradual deterioration in engine performance showing up on the charts. So, after the last test, I bought a set of sparkplugs and an ignition tune-up kit (points, condenser, rotor). That Saturday morning I installed them carefully and set gaps and dwell as best I could.

That Monday, I ran the car through the lane again and noticed a great improvement in performance, but also still some ignition "trouble." So I got a tune-up and the clinic repeated the power tests.

Road horsepower jumped from 68 to 73, with a peak reading of 75—a gain of 10 percent. Gas mileage went from 14 to 15 mpg, and the acceleration had returned.

Every one of the managers we talked to told us stories of mechanics from other local shops bringing in hard-to-find troubles that the diagnostic center equipment was able to find in minutes.

What about power-tuning? Theoretically, power-tuning can get the absolute top performance out of a car, but it can also open the door to problems. Power-tuning is simply adjusting the car to super-fine tolerances to squeeze out the last bit of power without modifications.

Most of the centers are willing to power-tune a car, at an extra charge, of course, and only with the customer's written approval. Adjusted for certain atmospheric conditions with a particular load of fuel, the settings could be way off when the weather changes or when you switch to a different gasoline. The clinic, naturally, does not want to be responsible for this.

The strictly stock automobile, of course, provides the best compromise between performance and reliability. The new diagnostic clinics will help you to stay *really* stock, getting out of your car all the power and efficiency that was built into it. ★★★

WINTER TUNEUP

(Continued from page 155)

clear of carbon. Clean all soot from the muffler too. This is done by first removing the exhaust pipe; then the piston is moved to bottom dead center and the carbon scraped from the exhaust port.

Drive chain. All drive chains stretch in time. No motorcycle chain should ever have more than $\frac{3}{4}$ in. of free play. To tighten the chain, turn the drive-chain adjusting nut, which is located on the rear fork, to the right. If this fails to tighten the chain sufficiently, take the chain off and remove a link from it. Then replace it as before.

Brakes. Activate the front brake lever and the rear brake pedal. Both should move no more than $\frac{1}{2}$ in. before engaging. Brake adjustments are made by turning the front and/or rear adjusting nuts: clockwise to decrease brake lever and pedal travel; counterclockwise to increase travel.

The wheels should be pulled and the brakes serviced every 5000 to 10,000 miles. It's not that brake linings wear out—they usually last a good 60,000 miles—but the linings do glaze and cut down braking power. Remove this glaze with emery cloth or armature paper. Blow dirt from the brake drum area at the same time. Take this opportunity, too, to relubricate the wheel bearings.

Clutch. Activate the clutch lever. It should give $\frac{1}{4}$ to $\frac{1}{2}$ in. before engaging. If it doesn't, adjust the clutch by means of the clutch adjusting nut, the location of which will be identified in your manual.

Tightening and lubrication. Vibration is the enemy of safe, comfortable cycling, and harmful to the bike as well. With one exception all nuts and bolts on your cycle should be turned down as tight as possible. Head bolts are the exception. These must be torqued to specification (see your manual) with a torque wrench.

Apply grease or oil at every lubrication point. You'll find a lube chart in your manual. Bear the following points in mind when lubricating your motorcycle:

- Use only a hand grease gun; a high-pressure gun will blow seals.
- Carefully examine the rear of the engine for oil leaks. These are extremely dangerous as they can spew oil onto the rear tire and cause the bike to go into a skid. Engine leaks may be caused by a loose bolt or by a ruptured seal in the lower crankcase.
- Replace crankcase oil and keep a close check on its level. An undetected loss of a half quart of oil from a motorcycle can spell trouble. ★★ ★

Carburetor gum can choke the life out of your engine

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NO LAND? BUILD ON AIR

(Continued from page 138)

Finally, it was discovered that far below the level of the street a piece of wood had become wedged in the two-inch air space separating one of the building's steel "legs" from the below-street railroad tracks. The bit of wood acted as a bridge through which track vibrations were transferred to the steel column. Eventually, the vibrations reached the wall next to the guest's bed. Removing the piece of wood solved the problem.

Today, most buildings occupying space that spans railroad tracks, subway beds and motor highways are insulated from the ground on which the traffic moves. Enormous lead, steel and asbestos "sandwiches" are put under support columns.

Air-rights construction really got rolling in New York around World War I, and within a decade Chicago followed suit. In 1927, the 25-story Daily News Building went up over the tracks of the Milwaukee R.R. And some years later the Chicago & North Western Ry. granted rights for the Sun-Times Building, the Merchandise Mart and other structures.

One of Chicago's larger recent air-rights projects is the \$100 million Gateway Center office building complex being constructed over the tracks entering the Union Station. It will occupy four city blocks, and three railroads will profit from use of this space. The Pennsylvania owns half of the rights; the Burlington and Milwaukee, a quarter each.

But the Illinois Central may have the



AIR RIGHTS and cantilever construction solved problem in erecting new Mercy Hospital in Baltimore

juiciest plum of all—51 acres of air rights over its tracks in the best possible location, right smack between Chicago's Loop and Lake Michigan. It's an air-rights builder's dream, the most valuable chunk of space in Chicago and perhaps in the world. Already the \$42 million Prudential Building is sitting atop the tracks, and a plush apartment building has been constructed to give tenants a gorgeous view of the lake on one side and Chicago's skyline on the other.

The rest of the property, though, is in a legal snarl at the present time, and a good many people including Illinois Central officials and real estate investors are watching the court battle.

Standing in the wings are drooling developers, ready to leap into action if the court rules in IC's favor. Proposed for this prize chunk of air rights are a batch of projects that would dwarf even New York's Rockefeller Center.

Here are some other interesting air-rights projects:

- In Baltimore, the three-story Hamburger apparel store recently built a 105-foot wing extending its second and third floors over Fayette St.

- In Buffalo, four stories of the new county public library will be built over downtown Allcott St. on seven 70-ton trusses, each 70 feet long.

- In Boston, the Massachusetts Turnpike runs under the new Prudential Center. And in Fall River, Mass., a municipal building complex has been proposed to bridge a new highway which will divide the town in two. ★ ★ ★



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SERVICING THE '66 CARS

(Continued from page 109)

perature wear, low-temperature rusting and deposits, high-temperature oxidation stability, high-speed cam and tappet wear and sludging and screen-clogging properties.

All Toronado steering linkage points should get a dose of multipurpose chassis lubricant every 12 months or 12,000 miles, whichever comes first. The four upper and lower ball joints require initial lubrication at 36,000 miles and thereafter every 12 months or 12,000 miles.

New fuel-metering design. In the new GM Quadra-Jet four-barrel carburetor (standard on some Chevrolets with the 327, the 396 and 427 engines on the Riviera, the Pontiac OHC Sprint Six, and the Olds Toronado, Cutlass 4-4-2 and Super Rocket engines), the primary and secondary sides of the carburetor differ in operation. The two small primary bores meter fuel through the venturi principle while the large secondary bores use an air-valve principle whereby fuel is metered in direct proportion to the air rushing through the secondary bores. Other V4 carbs only control the air flow through the secondary bores and rely upon the venturi principle to get the fuel into the air stream for mixing.

At a certain stage of primary throttle-plate opening (controlled by the accelerator pedal and engine load) primary bores can no longer meet the engine's fuel and air demands. At this point, the primary throttle lever, mounted at the side of the carburetor body and mechanically connected by linkage to the secondary throttle-plate shaft, begins to pull the secondary throttle plates open. Air rushing through the secondary bores creates low pressure beneath the air valve, and atmospheric pressure over the valve forces it open against slight spring tension.

Further opening of the air valve rotates a plastic cam attached to the center of the shaft and this cam pushes up a lever, raising the metering rods out of a fuel well. Fuel then flows from the float bowl into the secondary discharge nozzles and into the secondary bores. Increased engine speed increases air flow and the cam rotates still farther, permitting additional fuel to enter the engine as the tapered metering rods rise.

The factory sets the metering rods and no adjustment should be required unless they are damaged or bent. Air-valve flutter, which may occur from engine pulsations, is dampened by a dashpot piston operating in a fuel-filled bore in the carburetor body. The Quadra-Jet uses a

cleanable, sintered-bronze fuel-inlet filter with a pressure-relief spring, a closed-cell plastic float pontoon that is lighter than the conventional hollow-brass float and a float needle with a soft Viton, rubber-type tip, diaphragm-assisted to provide complete shutoff of incoming fuel if fuel-pump pressure should vary. In effect, fuel pressure counterbalances the float.

"Slushboxes" are simpler. Most automatic transmissions today can outthink most drivers. And they keep getting better—sometimes by the addition of another valve, sometimes by the removal of a unit. In the Chrysler TorqueFlite, the rear oil pump and the reverse blocker valve are eliminated from inside the case. New gating, for preventing accidental shifting into reverse while in forward motion, makes the hydraulically operated blocker valve unnecessary and improved front pumps and valve bodies have retired the rear pump.

Another transmission that has dropped the rear pump is the Turbo Hydra-Matic. The Powerglide is one of the few to retain this unit. Without the rear pump, push starts are impossible; but today's bumpers being little more than decorative tinfoil, jumper cables are a much better method to get yourself going again anyway.

Other power-train changes include the dropping of the conventional, leather-type rear axle pinion seal in the Dodge line. A "polycrylic" seal that has greater heat resistance and eliminates wick-like seepage is now used. And, to eliminate drive shaft vibrations, many new cars have constant-velocity universal joints, including Imperial, Lincoln Continental, Cadillac, some full-size Buicks and Toronado. These U joints cost much more than conventional cross-and-roller types, but they offer a smooth, vibrationless ride.

Plymouth and Dodge retain cross-and-roller joints, but they use a zero-degree drive line. This means the centerline of the engine and transmission is in a direct line with the centerline of the pinion gear in the rear axle. The result: less chance for driveshaft whip and smoother operation with changes in rear-axle up-and-down movement.

Another improvement for these two cars is new engine mounts. They're "tuned" to counteract drive line vibrations from rough roads at high road speeds, and they have been brought closer together so that the engine tends to roll more easily. Mounting life is at least triple that of earlier designs, say engineers.

All in all, the '66s promise to be the most trouble-free and maintenance-free cars ever. ★★ ★



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THREE HOTTEST ENGINES

(Continued from page 102)

lagged behind on every other test. Top speed range is from 138 to 145.

The Ford rode smooth and firm, thanks to the heavy-duty suspension. Overall, the ride was little different than in regular production models. In sharp curves there was some lean, but you never get the feeling that the car is tipping.

Except for the slow and heavy manual steering, the car was a pleasure to drive. Detents for each gear in the 4-speed transmission were positive and shifting was smooth. The manual clutch was soft, but it still had enough grab to handle the big torque of the engine.

A bit of skulduggery

This car had its defects, too. First of all, the engine stalled repeatedly, due to a high setting of the floats in the carburetors. Then the gears in the rear axle started to get noisy. Ford attempted to replace the rear end between the time I made acceleration runs and the next day when fuel economy tests were made. They wanted to put a 3.25 rear end in to replace the 4.11 that was used on acceleration tests. I vetoed the move.

Also, while the acceleration runs were in progress the shift linkage on the transmission was stretched to a point where shifting speed was severely affected. The transmission didn't want to go from gear to gear quickly, and it took some hard shoving to move the shift lever.

Of the three cars tested, I think the Ford suffered more from a poor combination of power, rear end ratios and tire size. The engine was just too much for the tires to handle. To get a good start from stop, the engine had to be cut way down or the tires would just sit there burying themselves in the asphalt. As a result, the Ford began its runs with the engine running at near stall speed.

The Dodge Coronet hemi that I drove weighed in at a surprisingly heavy 4419 pounds with all the equipment and crew aboard. Any big weight advantage Dodge may have started out with because of the intermediate size body was lost somewhere by adding heavy duty components. The car was beefed up with heavy duty springs and sway bar, special shocks, reinforced spring hangers, extra large police brakes, Sure Grip rear axle and a 5-clutch automatic transmission. Hemi buyers consider this the average equipment they want with the car.

The extra hard police tires and heavy duty suspension made the Dodge ride stiffer than Ford or Chevrolet. It actually

bordered on being harsh. But overall, the combination of the big engine and stiff ride made the Coronet a pleasurable car to drive. You have to keep in mind that the hemi is not only designed for cruising down the boulevard; it likes high speed and tight corners.

Dodge had TorqueFlite automatic transmission, using a special 5-clutch design that easily handles the power of the engine. It was easier to keep wheels from spinning off the line. And the transmission also eliminated some of the unsureness you get with manual shifting. Heavy duty components in the suspension and rear axle also got rid of another problem that seems inherent with high torque engines; speed-robbing wheel hop. The tires laid out a continuous strip of rubber.

Fastest family sedan?

While there was no available place to make speed runs at the top end, Dodge engineers assured me that the car I tested was capable of 145 miles per hour. And they said that's a conservative estimate.

Gas consumption at a steady 45 mph was a so-so 13.8 miles per gallon. Keep in mind that this mileage is impossible to duplicate in regular driving because of the constant speed of the car. Also, it is not quite the optimum mileage you can get under controlled conditions since the best economy readings are at 30-35 mph. However, all three cars were checked at the same rate of speed, and our figures are a valid comparison.

Speed times show the hemi makes the best use of its power in the passing ranges from 40-80 mph. It topped the other two cars in the 40-60 mph run at just under 3.1 seconds. For 60-80 mph it took 3.5 seconds, still ahead of Ford and Chevrolet. Combined times of 40-60 and 60-80 show the Dodge with a total of less than 6.6 seconds, while Chevy had 7 seconds and Ford 7.9.

In the quarter mile run Dodge took a tenth of a second longer than Chevy, but recorded an even 100 miles per hour, the highest of the three cars. A good indication of Dodge's power punch at high speed. Chevrolet's 427 was probably the most domesticated of the three cars I tested. The car wasn't slow, it just felt more like the family sedan than the other two. For one thing the suspension was not beefed up. Chevy had the same soft springs and shock absorber combination on the test car that it uses on its regular V8 sedans.

And the car was quiet. Power noise in the fastest acceleration runs was at about the level of a standard sedan. Exhaust noise was a trifle throatier though.

Unlike the Dodge and Ford, Chevrolet

has only one 4-barrel carburetor available with the 427, but it does the job in outstanding fashion. The extra gas mileage you get from the single carburetor is enough to convince me to stay way from more complicated setups. Besides, the top speed of this car is a rousing 142.5 miles per hour.

Economy champ

The Chevrolet got over 3 miles more on a gallon of gas than the next highest car. And these tests were run under almost identical conditions.

For those diehards who still want the extra punch of dual carburetion, the Chevy people tell me that custom performance shops are now offering multiple carburetor kits with special, high-capacity intake manifolds to fit the 427.

A word about clutches. It was surprising to note the softness of clutch action on Ford and Chevrolet; there was no heavy back pressure, no jerkiness. Still the clutches ran through more than five maximum acceleration runs with no noticeable loss in efficiency. No wonder the 4-speed boxes are so popular.

Extra equipment on the Impala test car comprised a 4-speed transmission, power brakes and steering, tachometer, AM/FM radio, tilt-and-telescope steering wheel, non-slip differential, power windows, viscos fan plus the regular SS model goodies. Total weight of the car in test was 4584 pounds including passengers and equipment.

I had a chance with the Chevrolet to see how these high powered cars behave on gravel roads. Believe me, it was an education. Those rear tires want to spin at the slightest pressure on the gas pedal. At any speed, and in practically any gear, that rear end is ready to come around and zip right past you.

Warranties changed

The auto companies have some screwy warranty rules for these cars, that depend on the corporate philosophy for racing. Ford will not warrant its engine at all, a realistic rule in light of the fact that almost all of the 427 engines it sells will end up in formal competition on the race-track. But the standard 24 and 24 warranty on the body is still good. I think Ford will even stand behind the engine, if you can prove it has had normal use.

Dodge will warrant its engine for 12 and 12. Chrysler people know that it would be foolhardy to give the usual 5 and 50 guarantee with the hemi, because these engines, by their very design, invite extreme use. If you race the hemi, though, (Please turn to page 228)

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THREE HOTTEST ENGINES

(Continued from page 227)

forget it. You can't expect anything from the company.

Chevrolet's racing ban has backed the division into a corner, to the benefit of the customer. Since Chevy officially doesn't go along with this racing business, it must take a head-in-the-sand attitude that the 427 is strictly for street use. As a result, the Chevrolet engine has the full warranty of 24 months or 24,000 miles, whichever comes first, just like any of its other cars. However, I think if you read the fine print on that warranty, you lose protection if the car is raced. ★★

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Tires	8.15 x 15 Firestone	8.25 x 14 U.S. Royal	7.75 x 14 Goodyear
Rear axle ratio	4.11:1	3.31:1	3.55:1
Weight including equipment & passengers	4504 lbs.	4584 lbs.	4419 lbs.
Approximate suggested retail price of car	\$4725	\$4575	\$3500

	Ford 427 Galaxie	Chevrolet 427 Impala	Dodge Hemi Coronet
0-30	3.4 sec.	3.3 sec.	3.66 sec.
0-60	7.2	6.7	7.06
40-60	3.2	3.2	3.06
60-80	4.7	3.8	3.5
¼ mile	14.5	14.8	14.9
1.4 mile speed	98.4 mph	91.0 mph	100.0 mph
Fuel economy at steady 45 mph	11.4 mpg	17.65 mpg	13.8 mpg
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In a talk before the National Audubon Society convention in Boston, John S. Gottschalk advocated a solution to the problem along four main courses: education, research, legislation and coordination. Mr. Gottschalk is director of the Bureau of Sports Fisheries & Wildlife of the U.S. Department of the Interior.

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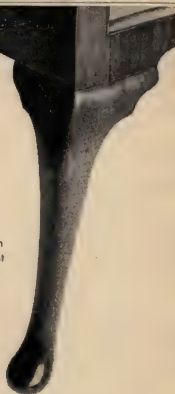


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LUXURY CAR

(Continued from page 99)

miles. Also, every car is dynamometer-tested for "50 miles," and each engine is run four hours before it's installed.

The body is remarkably rigid. It's made of steel, except for the hood and trunk, which are aluminum, and the doors, which are an aluminum-magnesium alloy to prevent corrosion. There's also a steel bar along the sides of the roof in case of a rollover.

The interior of our test car was appointed in fine leather, and the massive dash was carved from wood. The instrument layout was functional, and the steering wheel looked like a prewar Detroit part. Instruments included the ammeter, oil-pressure and water-temperature gauges. There were warning lights for low fuel, handbrake and battery discharge.

Rear seating was surprisingly confined, but the flat floor was an important plus. Rear passengers also had the convenience of folding picnic tables and footrests.

Driving the car was exhilarating, perhaps not even so much because of mechanical excellence as because of the Rolls image. Just looking down that long, straight expanse of hood gives one a feeling of power and status.

The big, 380-cu.-in. aluminum engine pulls the 21¾-inch, 4700-pound car easily. Rolls doesn't advertise horsepower, but there's plenty on tap. The four-speed automatic is positive, but not smooth.

Steering is moderately fast and fairly sensitive. Servo assist varies depending on effort required to move the driving wheels. Ride is unusually firm, even when the rear shocks are on the soft setting. At low speeds the ride is inferior to American luxury cars, but over really bad roads the suspension smooths out. Handling and cornering are markedly better than in the U.S. high-priced cars, especially when shocks are set at "firm."

Surprisingly, seat travel and rake adjustment are manually controlled. Standard features are power windows and a solenoid-operated gas-filler door. Other handy features are a single switch that controls fog, parking and headlights, a balanced control between front and rear radio speakers, adjustable front armrests, a dash socket that allows the battery to be charged without being removed, and a rear-window defroster consisting of hair-thin wires embedded in the glass.

Rolls also offers a long list of options: extra-wide rear seat, ladies' vanity, trunk picnic table, built-in bar. Even the shift lever can be switched from the right to the left side of the steering column.

But the big surprise is that a new Rolls model has been introduced. It wasn't available here at this writing, but on paper it promises to be an exciting, modern design. Called the Silver Shadow, it has sleek styling and four-wheel disc brakes. Independent suspension, long considered an unnecessary complication by Rolls, is now used. To hold an even keel regardless of load, an automatic hydraulic height control is fitted. Length, width and wheelbase are all smaller, but the engine remains unchanged. Price is yet to be announced.

The ultimate in luxury. Most impressive of our test cars was the "Grand Mercedes," the 600 sedan. The styling is boxy and functional and, with a jet-black finish such as our test car had, exudes an efficient Teutonic arrogance.

The dash is modern and businesslike. A tachometer and speedometer, both big and round, enjoy prominent positions, along with temperature and oil-pressure gauges. There's also an aurora borealis of colored warning lights for right and left generators, low hydraulic pressure, high ground clearance (when the air suspension is raised) and high beams.

Hydraulically operated accessories include trunk lid, shock adjustment all around from hard to soft, windows, seats, heat and vent flaps and automatic parking-brake release. Everything works in complete, almost ominous silence. Even the doors close automatically, with just a whisper.

Front seats have power adjustment fore and aft, up and down, and for angle. The rear seat reclines partially. These rich, leather-covered seats, incidentally, were probably the most comfortable we've tried.

One lever controls directionals, the two-speed wipers, headlight flasher and windshield *schpritzer*. A switch lets you select either the loud or the soft air horn. The loud one, which sounds like a rhinoceros in labor (only worse), should be used "only outside built-up areas," according to the owner's manual. We tried it on a few New York cab drivers. It's the only thing we've ever found that scares them.

Other interior features include a mirror that breaks on impact, a rear-window defroster with warning light, a steering wheel that telescopes, an aerial that automatically rises and retracts when the radio is switched on and off, all kinds of reading and courtesy lights and a vacuum-operated central door-locking system.

This destroyer weighs all of 5446 pounds, but its 386-cu.-in. double-overhead-cam V8, conservatively rated at 300 hp, pushes the car to 60 mph in just about 10 seconds. Mercedes claims a top speed of 127.4 mph. Perhaps this is optimistic, but

the car is definitely built for high-speed, long-distance cruising—as is indicated by the 29.6-gallon fuel tank.

It's hard to believe that such a heavy-weight could handle well, but it does. With shocks set at "hard," cornering approaches that of a sports car. And ride isn't objectionably firm. On soft setting, ride is close to perfect. The turning diameter is an amazing 39.5 feet. Even the Corvette needs more room.

The automatic transmission is exceptionally positive. And it can be overridden to hold second, third or fourth gear.

The last car on our list, a Jaguar 4.2 Mk X, listed for \$7950 as equipped. It had \$960 worth of options, including radio, white walls, power windows, tinted glass and airconditioning. We expected it would be a letdown after cars costing over twice as much. We were wrong.

Its styling was probably the handsomest. The interior was impressive, with a massive wooden dash, rich leather pleats and an array of toggles and gauges that would delight an astronaut. There's full instrumentation: tachometer, ammeter, oil-pressure and water-temperature gauges. And warning lights for ignition and for hand-brake and brake fluid level. Rear-seat passengers have two folding picnic tables.

The Jag is sporty first, luxurious second. It's the only car that offers a four-speed stick as well as an automatic. And there's that gleaming racebred 258-cu.-in. dual-overhead-cam Six with three carbs.

The three-speed-plus-torque-converter automatic is positive but, like the Rolls unit, not the smoothest. It offers some manual control. "L" locks in second or first, allowing a two-one shift but never an upshift into third.

The car isn't as quiet at speed as the others. Rear passenger room is skimpier, though still adequate for five passengers. Panel lights have no rheostat, just a two-way switch. Seats adjust manually, but do have a rake control. Even the aerial is manually operated, by a pencil-sharpener-like crank under the dash.

But that little Six cranks out over one hp per cubic inch, which gives acceleration almost as good as that of the Mercedes. One performance feature it shares with Mercedes is the standard-equipment, limited-slip differential. Cornering and general handling are unsurpassed by any of the other five cars.

Are these cars worth the extra money? It depends. If you can afford it, and if you appreciate luxurious, trouble-free transportation, the answer is a resounding yes. We found it hard to readjust to our own cars after our tests were over. Guess we're in the wrong (b)rocket. ★★

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